OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

JANUARY 9, 1950
VOLUME 39, NO. 1

AMERICAN DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY · BLEACHING · DYEING · PRINTING · FINISHING

IMPORTANT ANNOUNCEMENT TO THE WOOLEN INDUSTRY

Durable Mothproofing

Is **NOW** a Scientific Fact

Mothproofed with® MITIN

Woolen Manufacturers Now Have In

MITIN

the TOP RANKING mothproofing agent. MITIN F F Conc, in substance and effect, is a colorless dyestuff rendering woolens and worsteds durably mothproof. Here at last is a mothproofing agent which withstands the rigors of dry and wet cleaning, washing, weathering, sunlight and mill processing, and all combinations of those rigors, for the usable life of most woolens and worsteds.

MITIN F F Conc was scientifically conceived and laboriously created by Geigy. It is protected by U. S. Patent #2,311,062. It is honestly presented after passing the Tentative Test Methods of the AATCC and after constant use in Continental Europe, Great Britain and Canada. Geigy considers MITIN one of its outstanding achievements.

MITIN is applied in mill processing only—in most cases simultaneously with the dyestuff when one operation dyes and mothproofs. Prime cost is the only cost—and it is moderate.

A marriage with MITIN gives your product a new sales "lift"—that's why

MITIN with the Dye Makes the Public Buy

Send TODAY for descriptive literature and scientific data or ask to have a Geigy specialist call on you.

Geigy

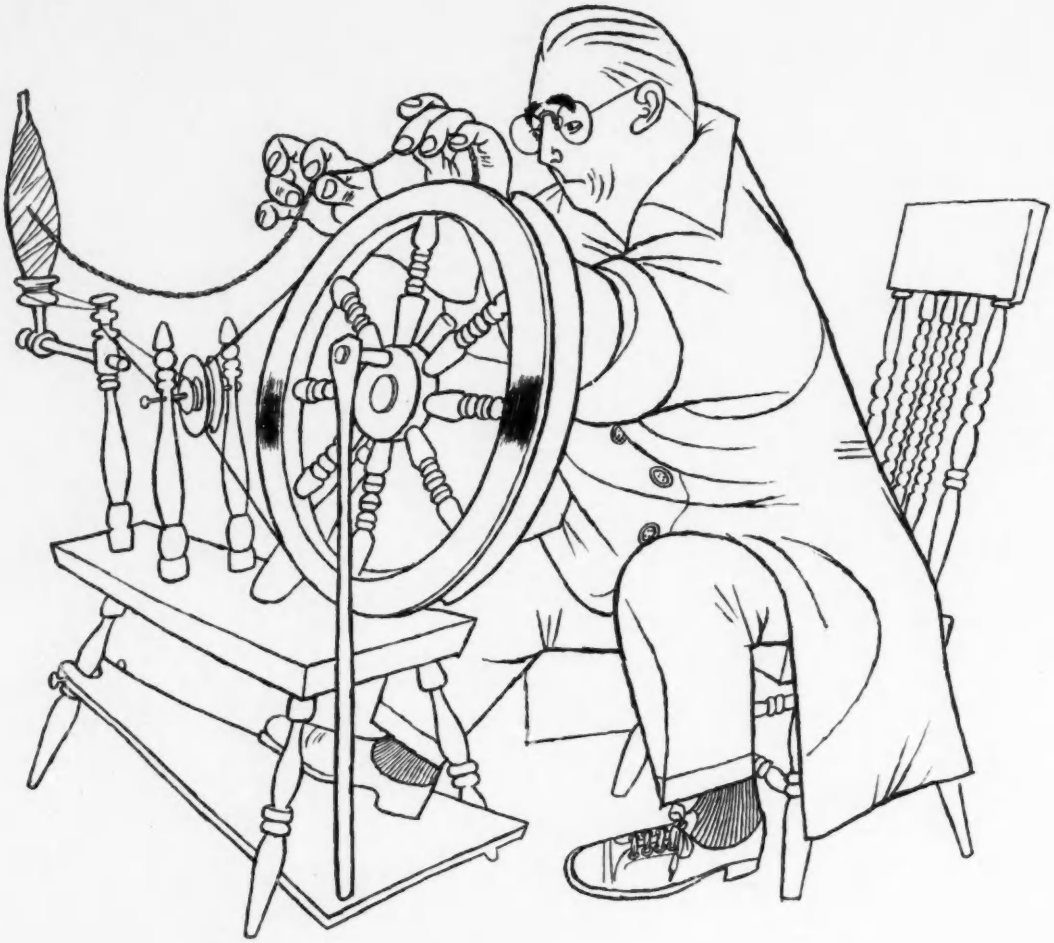
Dyestuff Makers Since 1859

GEIGY COMPANY, Inc.

89-91 BARCLAY STREET, NEW YORK 8, NEW YORK

BRANCH OFFICES: Boston • Charlotte, N. C. • Chicago • Los Angeles • Philadelphia Portland, Ore. • Providence • Toronto

IN GREAT BRITAIN: The Geigy Co., Ltd., National Buildings, Parsonage, Manchester



If you make textiles...

(No matter how you make them, you need detergents.)

the Armour man is the man to see because he has more different soaps and synthetics than anybody !

(He's bound to have just the ones you need. Write him today.)

ARMOUR *Industrial Soap Division*

Armour and Company • 1355 West 31st Street • Chicago 9, Illinois

American Dyestuff Reporter, Vol. 39, No. 1, January 9, 1950. Published every other Monday. Copyright 1950, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00. Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

For dyeing popular shades of wine reds—
COPRANTINE BORDEAUX BGL Conc.

COPRANTINE COLORS

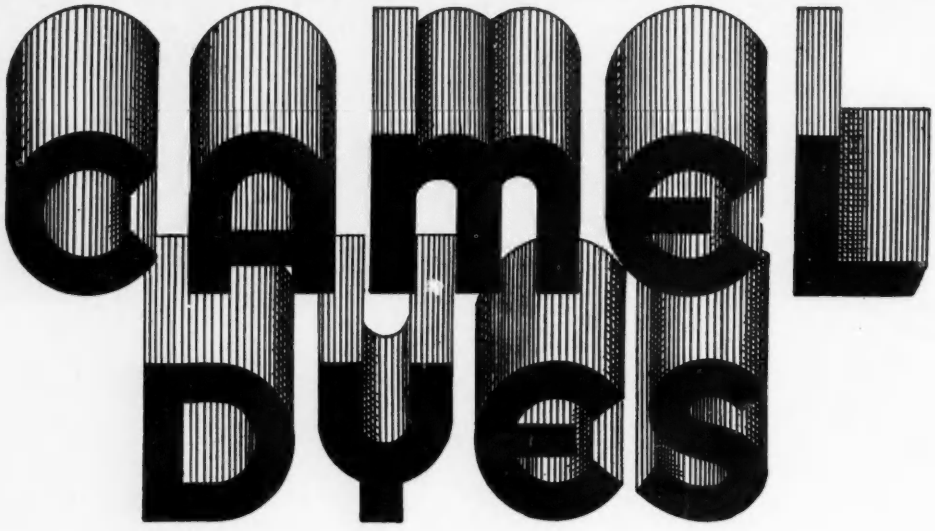
BETTER MONEY VALUE . . . BETTER WASH AND LIGHT FASTNESS ON VISCOSE RAYON AND COTTON • WOOL BLENDS • ACETATE BLENDS IN YARNS, HOSIERY, KNIT GOODS, WOVEN FABRICS

ESPECIALLY RECOMMENDED FOR PACKAGE MACHINE DYEING

BROWNS . . . TANS

DYESTUFFS · CHEMICALS · INTERMEDIATES
CIBA COMPANY, INC.
627 Greenwich Street
NEW YORK
BOSTON PROVIDENCE CHICAGO SAN FRANCISCO CHARLOTTE PHILADELPHIA
VAT DYES OF THE DOW CHEMICAL CO.

For dyeing popular shades of greens—
COPRANTINE GREEN G Conc.



THE CAMEL LINE OF

DEPENDABLE DYESTUFFS

has served the textile mills of America without interruption since

1876.

This broad experience assures

PROMPT • EFFICIENT • ECONOMICAL SERVICE

TO MEET ALL DYESTUFF REQUIREMENTS

JOHN CAMPBELL & COMPANY, INC.

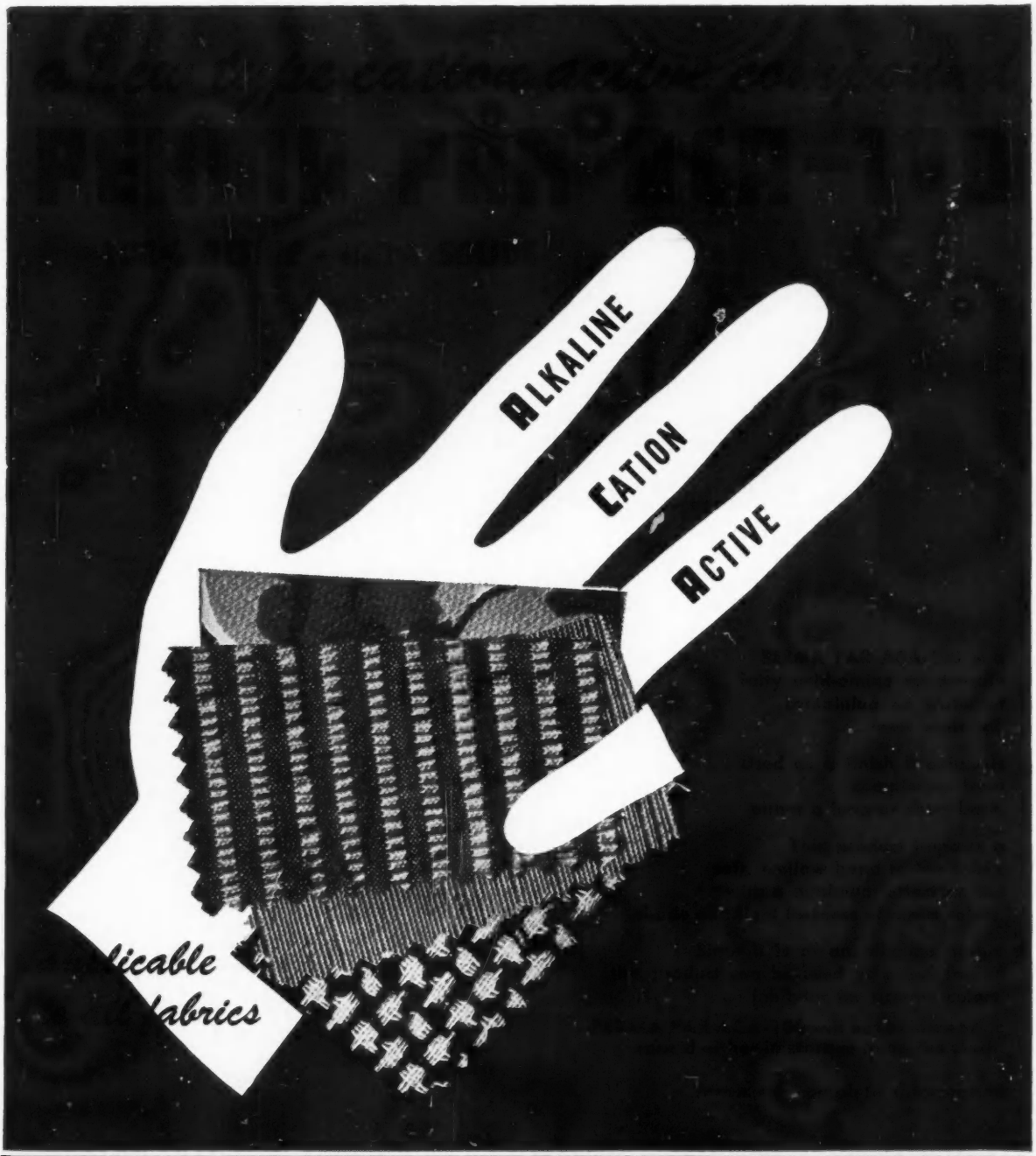
75 HUDSON STREET • NEW YORK CITY

TELEPHONE: BArclay 7-6228-6229

2520-22 NORTH BROAD STREET, PHILADELPHIA 32, PA. • TEL. RADCLIFFE 5-7103-4

BRANCH OFFICES AND WAREHOUSES:

BOSTON · EAST CLEVELAND, OHIO · ATLANTA, GA.



REFINED PRODUCTS CORPORATION

BEAUTY AND THE BEST

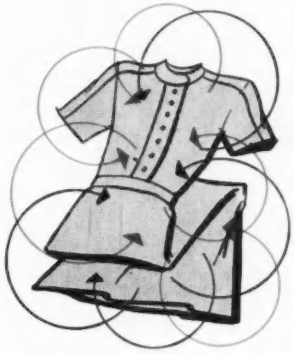
. . . and the best in beautiful hosiery retains its clear dullness, its fine tone, from dye bath to consumer. Yes, no matter the denier you run, the hand you desire or the boarding method you use, Fanco finishes will seal in the beauty of your product . . . protect its loveliness throughout its lifetime. Your Fanco fieldman will gladly prove this with a no-obligation, on-the-spot test.

W. F. FANCOURT co.
Philadelphia, Pa.
In the South
Howard A. Virkler
Greensboro, N. C.

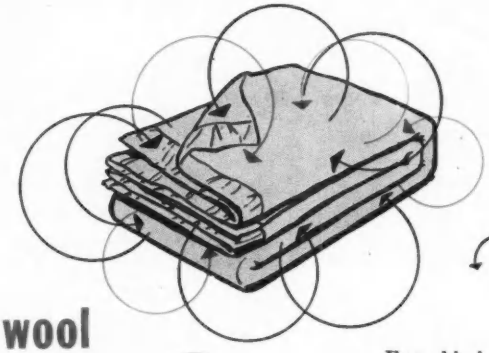
SOLVING FINISHING PROBLEMS SINCE 1904

SANTOMERSE No. 1

...hard-working detergent and wetting agent

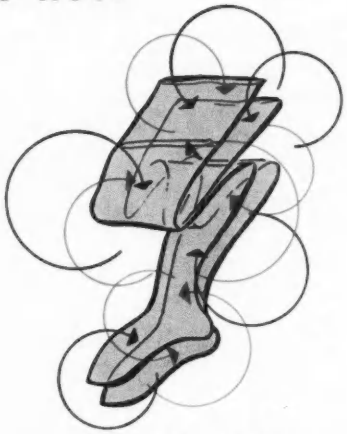


for cotton



for wool

ACTIVATION



for synthetic fibers

From kiering to scouring after acid aging . . . in any textile process needing a reliable detergent, wetter, emulsifier or penetrant . . . Santomerse No. 1 proves itself to be efficient and economical. No other product in the classification of Santomerse No. 1 wets faster, penetrates deeper or cleans cleaner.

Santomerse No. 1 is the *all-purpose* detergent and wetting agent . . . for cotton, wool and synthetic fiber processing. It gives excellent results in hard or soft water . . . in acid or alkaline baths . . . in hot or cold solutions. Santomerse No. 1 rinses out quickly and thoroughly . . . does not form insoluble curds and can be used for removing such deposits formed by other materials.

For technical assistance in the use of Santomerse No. 1 in any phase of textile production . . . or for technical literature . . . mail the coupon, contact the nearest Monsanto Sales Office or write: MONSANTO CHEMICAL COMPANY, Desk A, Phosphate Division, 1779 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

MONSANTO SYNTHETIC DETERGENTS AND WETTING AGENTS

Santomerse* No. 1
Santomerse No. 3
Santomerse No. 3 (Paste)
Santomerse 30X
Santomerse D
Santomerse S
Sterox* CD
Sterox SE
Sterox SK
Sterox 5
Sterox 6

*Reg. U.S. Pat. Off.

MONSANTO CHEMICALS

MONSANTO CHEMICAL COMPANY
Desk A, Phosphate Division
1779 South Second Street, St. Louis 4, Missouri

Without cost or obligation, please provide information indicated by "X":

.....Technical data on Santomerse No. 1: .....Send your representative to discuss the use of Santomerse No. 1 in.....

.....

Name.....*Title*.....

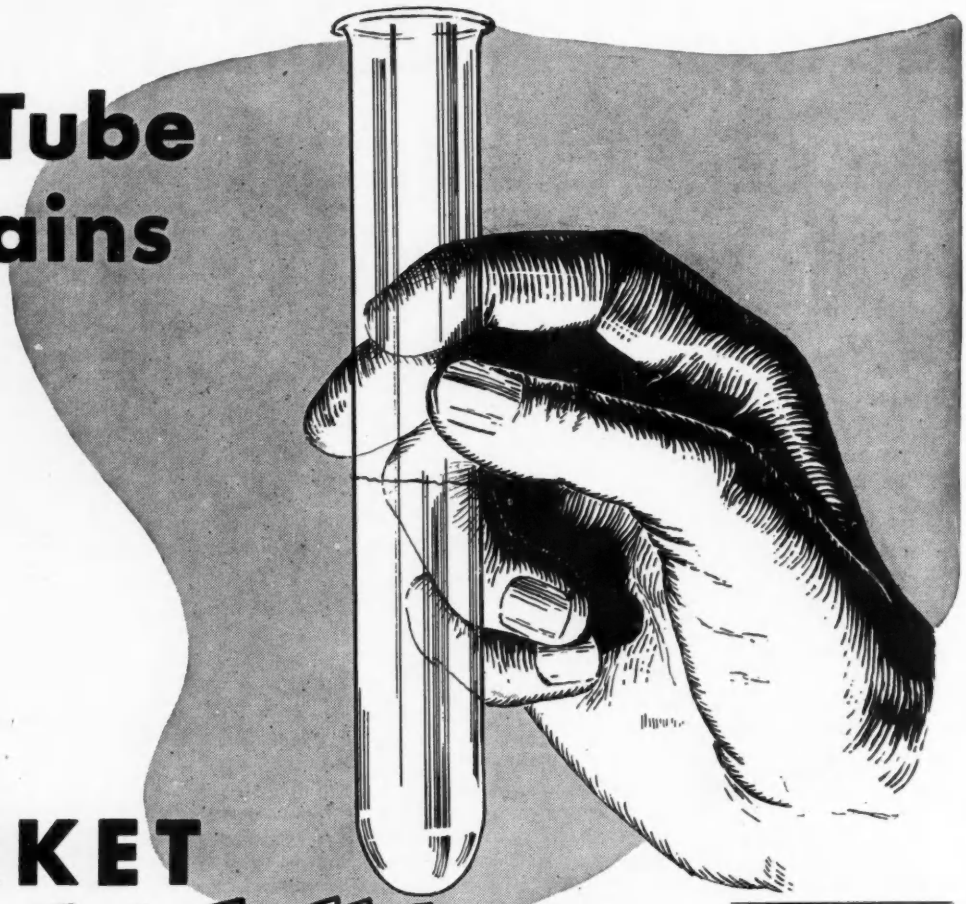
Company.....

Street.....

City.....*Zone*.....*State*.....

SERVING INDUSTRY . . . WHICH SERVES MANKIND

This Test Tube Contains



MARKET MAGIC!

Yes, it's full of increased sales-appeal and color stability for your finished products—because it's full of Heat-Tested Gross Stearic Acid. It's this heat test, which every shipment of Gross Stearic Acid must pass, that's responsible for the whiter color, the superior odor, the continued acceptance of A. Gross' Stearic Acid.

Write today for our booklet, "Fatty Acids in Modern Industry," which describes this and other A. Gross products. We'll be glad to send you samples, too.

A. GROSS PRODUCTS

Stearic Acid
Tallow Fatty Acids
Red Oil (Oleic)
White Oleine
Coconut Fatty Acids
Cottonseed Fatty Acids
Soya Bean Fatty Acids
Mixed Caprylic & Capric Acids
Saponification
Crude Glycerine
Stearine Pitch
Cottonseed Pitch
Hydrogenated Tallow Fatty Acids

MANUFACTURERS SINCE 1837

A. GROSS & Company

295 MADISON AVE., NEW YORK 17, N. Y.
FACTORY: NEWARK, N. J.

AGENTS:

George Mann & Co., Inc.
Providence 3, R. I.
Baker & Gaffney
Philadelphia 7, Pennsylvania
J. C. Ackerman
Pittsburgh, Pa.
Moreland Chemical Co.
Spartanburg, S. C.
Braun Corp.
Los Angeles 21, Calif.
J. W. Stark Co.
Detroit 2, Mich.
Smead & Small, Inc.
Cleveland 15, O.
Braun-Knecht-Heimann Co.
San Francisco 19, Calif.
Charles Albert Smith, Ltd.
Toronto 3, Canada
Thompson Hayward Chemical Co.
Kansas City 8, Mo. (and branches)
James O. Meyers & Sons
Buffalo, New York

KELTEX

THE modern PRINT PASTE THICKENER

color-rich color-sharp prints

on acetate, viscose and pure silk dress goods printed with acetate, acid and direct colors or with white discharge

Keltex gives you these outstanding benefits:

- Exact and uniform printing paste viscosity
- Sharp, clean printing
- Maximum color penetration
- True, even color yield
- Easy and economical to use
- Free from grit and cellulose – needs no filtering
- Readily soluble in cold water
- No cooking or special treatment
- Easily washed out after printing for soft and pliable hand

KELTEX REFINED ALGIN PRODUCT

KELTEX® A PRODUCT OF **KELCO COMPANY**

20 N. Wacker Drive
CHICAGO 6

31 Nassau Street
NEW YORK 5

530 W. Sixth Street
LOS ANGELES 14

Cable Address: Kelcoalgin — New York

NYANZA

ANILINE & ALIZARINE COLORS

•

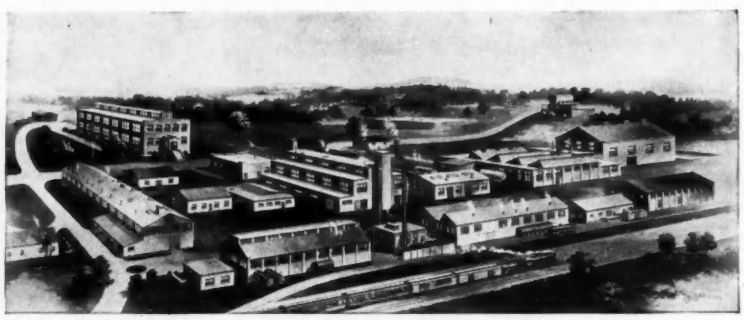
TEXTILE CHEMICALS

•

FINISHING MATERIALS

FOR

WOOL — COTTON — RAYON — ACETATE
AND MIXED FIBERS



FACTORY AT ASHLAND, MASSACHUSETTS

NYANZA COLOR & CHEMICAL COMPANY, Inc.

109 WORTH STREET NEW YORK 13, N. Y.

FACTORIES:

CHEMICAL MANUFACTURING CO., ASHLAND, MASS. • NEW BRUNSWICK CHEMICAL CO., NEWARK, N. J.

BRANCHES:

ASHLAND, MASSACHUSETTS

549 West Randolph St., Chicago, Ill. • 675 Drexel Bldg., Philadelphia, Pa. • 115 S.W. Fourth Ave., Portland, Ore.

304 E. Morehead St., Charlotte, N. C.

CANADIAN AGENTS:

Charles Albert Smith Limited, 123 Liberty St., Toronto, Canada

Sure— We're enthusiastic!

More and more manufacturers of wool fabrics and wool products are turning to SCHOLLERIZING* for wool shrinkage control, because SCHOLLERIZING *protects the quality* of the wool . . . sacrifices nothing to attain complete washability . . . invariably *enhances tensile strength* . . . eliminates matting and felting . . . retains original "hand" or feel, texture, appearance, elasticity, resiliency and recoverability.

YES, SCHOLLERIZED WOOL IS **BETTER** WOOL **BECAUSE** IT'S SCHOLLERIZED!

Your own dyer or finisher can SCHOLLERIZE your wool fabrics. So easy in application . . . so uniform in results!

SCHOLLER BROTHERS, INC.

Manufacturers of Scouring, Dyeing and Finishing Materials

COLLINS at WESTMORELAND, PHILADELPHIA 34, PA.

IN CANADA: SCHOLLER BROTHERS, LTD., ST. CATHARINES, ONTARIO

Write today for full details on the Scholler Wool Shrinkage Control Process as applied to your wool product . . .

*U. S. & FOREIGN PATENTS PENDING

Schollerized WASHABLE WOOL SAFE TO TUB • SAFE TO RUB

MANUFACTURERS OF SOAPS, SOFTENERS, SULPHONATED OILS and FINISHES

• SERVING THE TEXTILE INDUSTRY SINCE 1907 •

NONIC 218

non-ionic surface active agent

Sharples Nonic 218 is suggested for the following textile applications:

IN WOOLEN AND WORSTED MILLS

scouring of raw wool.

scouring of piece goods.

removal of paint or pitch used for marking sheep.

penetrating agent for dyeing with non-level type acid dyes.

scouring agent for removing excess or uncured urea- or melamine-formaldehyde resins.

IN COTTON AND RAYON MILLS

kier assistant for cotton.

desizing and scouring woven rayon or cotton in the open boil-off.

leveling and penetrating assistant in vat dyeing.

dispersing agent with vat dye printing pastes and in the vat acid process.

simultaneous scouring and redyeing of cotton knitting yarns.

scouring agent for removing excess or uncured urea- or melamine-formaldehyde resins.

scouring of printed and vat dyed fabrics.

For Sample write Dept. J.

SHARPLES TRADE MARK CHEMICALS

Sharples Chemicals Inc.

NEW YORK · PHILADELPHIA · CHICAGO

Rapidogens® for printing

fast colors on cotton, rayon and linen

brilliant colors outstanding for clarity and depth.

extensive color range many important shades are exclusively GDC.

fastness excellent fastness to washing—very good fastness to light.

powders and solutions both forms are available.

application develop rapidly in acid ageing—many can be developed in neutral ageing.

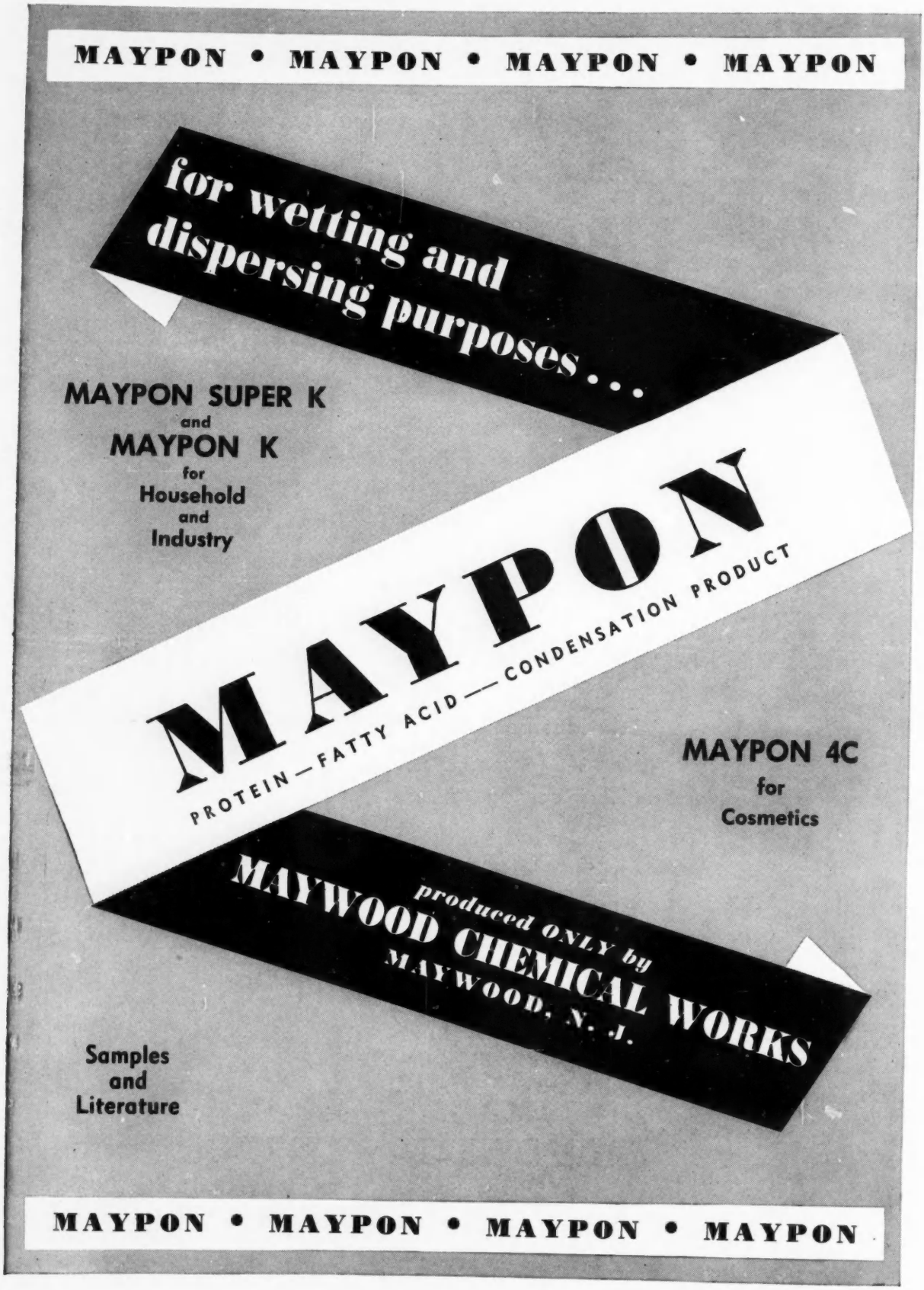
versatility can be printed alongside Indanthrenes and Algosols.

economy combine quality with ease of application.

GDC **GENERAL DYESTUFF CORPORATION**

435 HUDSON STREET • NEW YORK 14, NEW YORK

BOSTON • CHARLOTTE • CHICAGO • PHILADELPHIA • PROVIDENCE • SAN FRANCISCO


MAYPON • MAYPON • MAYPON • MAYPON
for wetting and dispersing purposes . . .
MAYPON SUPER K
and
MAYPON K
for
Household
and
Industry
MAYPON
PROTEIN—FATTY ACID—CONDENSATION PRODUCT
MAYPON 4C
for
Cosmetics
produced ONLY by
MAYWOOD CHEMICAL WORKS
MAYWOOD, N. J.
Samples
and
Literature
MAYPON • MAYPON • MAYPON • MAYPON

70% of all rayons are processed in plants that use AHCOVELS

here's why

AHCOVELS are *substantive* softeners that meet exacting finishing requirements for rayon, cotton, wool, linen and synthetic fabrics.

AHCOVELS are odorless and will not "yellow" whites.

AHCOVELS are permanently resistant to usual laundering and dry cleaning processes.

AHCOVELS are stable under extreme heat.

AHCOVELS E, F and R are both *anionic* and *substantive*. They assure full retention of light fastness in dyed fabrics and are compatible with anti-fume agents.

For economy . . . finer finishes . . .
softer drape and hand . . . use AHCOVELS.

ARNOLD-HOFFMAN
Providence, Rhode Island

Additional information or recommendations on specific finishing problems will be supplied through any of our offices.

ARNOLD-HOFFMAN & CO. INCORPORATED • EST. 1815 • PROVIDENCE, RHODE ISLAND
Plants at Dighton, Mass.; Charlotte, N. C.; Cincinnati, Ohio; Offices: Providence; New York; Cincinnati; Philadelphia; Charlotte

Olate TAKES MIGHTY GOOD CARE OF MAN-MADE FIBERS AND FABRICS

Your choice of a soap for scouring, dyeing and finishing man-made fibers and fabrics cannot safely be based upon efficiency alone. Some soaps are long on efficiency but short on gentleness. They can stir up plenty of grief in processing.

You'll get all the efficiency you demand when you process with Olate. But you'll get exceptional gentleness, too. The performance of this pure, neutral, low titer flaked soap is second to none. It does a superb job in raw wool scouring, in yarn finishing, in fulling and scouring woven and knitted fabrics, and in scouring and dyeing hosiery.

Olate

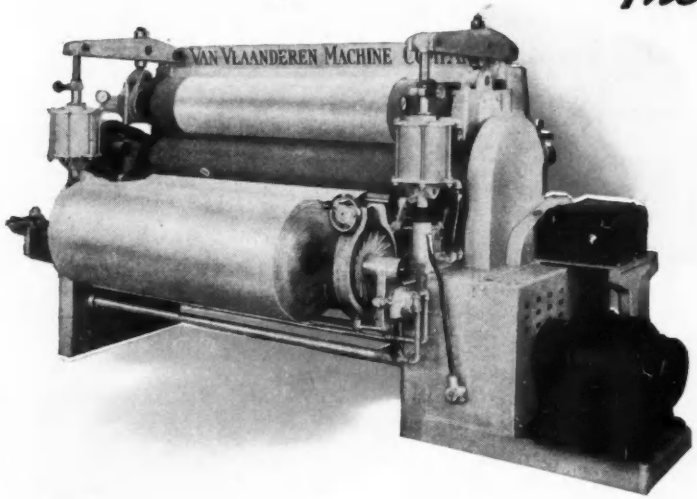
All down the line, Olate can help your mill smooth out production worries. You can prove it with a month's trial.

PROCTER & GAMBLE, CINCINNATI, OHIO

Safe and efficient for every textile soap usage

A MACHINE of OUTSTANDING VERSATILITY and PERFORMANCE

The VAN VLAANDEREN PADYE and RESIN IMPREGNATOR



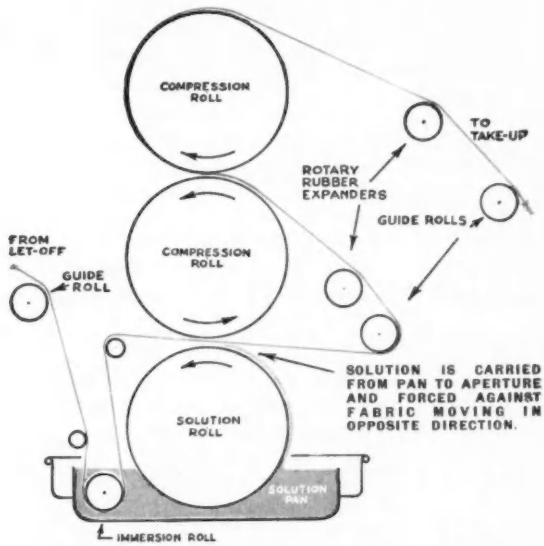
The V.V. Padye and Resin Impregnator has time and again proven its superiority, versatility, and high production in a wide variety of exacting applications. For applying dyes, resins and chemics its performance is unsurpassed. This is the result of patented features found in no other machine.

HERE'S WHY IT'S DIFFERENT AND BETTER

The bottom roll is driven independently and variably in a direction opposite to the travel of the goods. This carries solution from the pan into the aperture. Through centrifugal force and the momentum imparted to the solution carried by the roll it is forced into every fiber as the goods passes in an opposite direction through the restricted space between rolls. This is the time when the fabric is in its most receptive condition—free from pressure.

This patented feature, exclusive with Van Vlaanderen assures the most thorough penetration of the goods by the solution. By adjustment of the speed of the bottom roll and size of the restricted aperture the degree of penetration is always under complete control.

After penetration of the cloth by the solution the goods pass between compression rolls for further penetration and removal of excess liquor.



Shown in diagram above is the advanced principle on which the Van Vlaanderen Padye and Resin Impregnator operates. Notice how the independently and variably driven bottom roll carries solution to the aperture where it is forced into the goods.

VAN VLAANDEREN MACHINE COMPANY

370 Straight Street, Paterson 3, New Jersey • Cable address: Vlaanderen, Patersonnj, U.S.A.

World's largest manufacturer of machines for processing modern fabrics

ONYX RESINS for TEXTILES

DATA FOR FILING **JANUARY, 1950**

GENERAL DATA

Synthetic resins have established wide fields of use in the finishing of textiles.

Onyx supplies a number of special synthetic resins for textile finishing, with well established applications. All Onyx Resins and Xyno Resins, however, have potential uses which deserve exploration along the lines of stiffening, wear resistance, crush resistance, springiness, etc. This data sheet summarizes the various resins of the Onyx line together with information as to their properties and uses.

Condensation Polymers

Onyx Resins . . . NCF Paste and Liquid Resin SS, urea-formaldehyde resins . . . are supplied in a semi-polymerized state, the former requiring the addition of a catalyst and heat to complete polymerization. In practice, polymerization is effected, not only on the surface of the fabric, but throughout its fibers as well. Resin particles are sufficiently small to allow rapid and efficient penetration into the fibers themselves. They polymerize in the fabric to form rigid, three-dimensional resin molecules.

Linear Addition Polymers

Xyno Resins are water dispersions of linear addition resins. They result from the end-to-end joining of hundreds, or perhaps thousands, of smaller molecules to form very long, flexible ones of high molecular weight. Xyno Resin dispersions AA40, S69, 362, Xyno Resin solutions 497 and 497S, are supplied in a fully polymerized state, applied directly to the fiber and requiring no catalysts or heating or curing. Xyno Resins find their largest uses in the treatment of fabric surfaces where deep penetration is not an essential factor.

Onyx Resins

Crush Resistance

Onyx NCF Paste finds its major application in the imparting of crush resistance to cotton and rayon fabrics and rayon blends. Impregnation of spun rayon with some protein finishes and NCF Paste produces a wide range of springiness besides considerably reducing shrinkage.

The resin is applied in a semi-polymerized form together with Onyx Catalyst AL which effects complete polymerization to a urea-formaldehyde resin. Actual treatment of fabrics with NCF Paste together with catalyst may be carried out in the mangle or pad, followed by drying in the dry box. Curing for 3-5 minutes at 310-325° F. immediately precedes washing.

See Onyx Technical Data Sheet No. 8-T for complete details.

Modifying Chintz Effects, Stiffening

Onyx Liquid Resin SS, another urea-formaldehyde resin of the condensation polymer class, has excellent stiffening characteristics, and imparts chintz effects. It is used either alone or most effectively in combination with NCF Paste or Xyno Resin AA40.

Onyx Technical Data Sheet No. 20-T describes Onyx Liquid Resin SS in complete detail.

Xyno Resins

General Purpose Finish

Xyno Resin AA40 is a water-thin dispersion of moderate particle size. It is an excellent general purpose finish for cotton and rayon fabrics. Its stiffening effects on ribbons and dress piece goods are especially satisfactory.

Xyno Resin AA40 requires no curing or heat treatment. It is applied at room temperature, alone or in combination with Onyx Liquid Resin SS or Onyx NCF Paste. Added springiness, crispness and improved durability during laundering may be obtained by the latter method. See Onyx Technical Data Sheet No. 14-T for further details.

Ninons, Marquisettes, Organdies

Xyno Resin 362, a vinyl resin dispersion of large particle size, provides the stiffest hand of the Xyno Resin dispersions. Used in combination with such Onyx softeners as Stearo Glyceryl Sulfate and Mapromol HSY, it has proved highly successful in the treatment of ninons, marquisettes and organdies. Xyno Resin 362 also imparts a wide range of stiffness to cotton, rayon, acetate and nylon fabrics. The resin has greater penetrability than starch, and due to its relatively low viscosity, does not require elevated temperatures during application. See Onyx Technical Data Sheet No. 19-T for complete details.

Wear Resistance

Xyno Resin S69 offers the best wash resistance of all the Xyno Resin dispersions. It is a dispersion of a thermoplastic copolymer that increases wear resistance and gives a wide range of sizing, stiffening and impregnating effects on all common fabrics. Through its use, a noticeable decrease in slippage, and a definite dulling effect on acetate are obtained. Onyx Technical Data Sheet No. 18-T describes S69 in more complete detail.

Resin Solutions

First of a series of Xyno Resin solutions are Xyno Resins 497 and 497S, the ammonium salt and sodium salt, respectively, of a thermoplastic polymer. The outstanding property of Xyno Resin solutions is their complete water solubility and consequent easy application to all fabrics. They offer interesting possibilities for stiffening and imparting body to textiles.

onyx CHEMICALS FOR DYEING • FINISHING • PRINTING

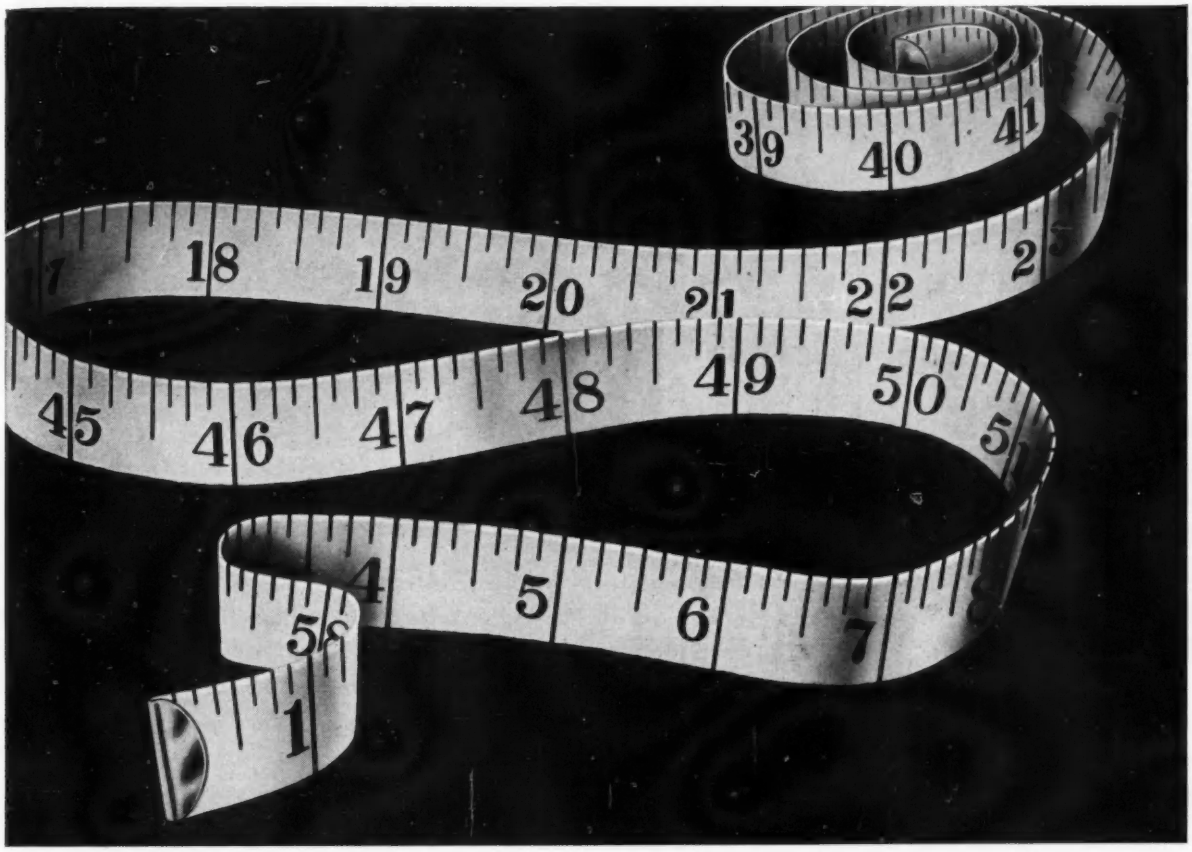
ONYX OIL & CHEMICAL COMPANY

JERSEY CITY 2, N. J.

CHICAGO • BOSTON • CHARLOTTE • ATLANTA

In Canada: Onyx Oil & Chemical Co., Ltd. Montreal, Toronto, St. Johns, Que.

For Export: Onyx International Jersey City 2, N. J.



How would you measure an ENZYME?

Not with a tape measure . . . or a foot rule . . . or a yard stick.

Enzymes, as blended to make Diastafor brand de-sizing agent—Type L, are measured by their *special values* in your finishing and dyeing operations.

Measured in terms of workability under widely varying conditions, Diastafor Type L can be used in an unusually wide range of temperatures and pH, which brings great flexibility and ease to your de-sizing operations.

Measured in safety. Diastafor gives you a helping hand when you have to finish a "problem lot," or when variables in water or in sizing formulas create new and unexpected problems.

Measured in results, Diastafor can be depended on for a good "hand" and a fine finish whether you are working with cottons, rayons or mixed goods. Diastafor helps keep your dyeing even and unshaded, with no streaks or blemishes, no impairment of tensile strength.

Measured in economy, you get more enzymes per penny with Diastafor.

If you'd like to make your own measurement of the value of enzymes in your dyeing and finishing, try Diastafor, Type L, on one of your hardest lots. Its successful performance has made it the leader for over 40 years.

Our sales and technical staffs will be glad to give you further information about Diastafor. Write Standard Brands Incorporated, *Diastafor Department*, 595 Madison Avenue, New York 22, New York.

DIASTAFOR

A TRADE MARK OF STANDARD BRANDS INCORPORATED

lower de-sizing costs

RAPIDASE®

for Cottons, Rayons, Mixed Goods

An amylolytic enzyme preparation particularly adapted for faster, more economical de-sizing in any equipment. Its wide range of operation temperatures permits highest speed with most economical production. Its starch-solubilizing action is doubled with each 18° rise in temperature between 120° and 200° F.

higher quality work

SERIZYME®

for Acetates and Acetate-Rayon Mixtures

A proteolytic enzyme product that safeguards against streaky dyeing . . . Produces a finer hand . . . Assures uniform quality . . . Clearer cross dyes. SERIZYME liquefies protein and albuminous sizes and removes them completely.

Our technicians are available to visit your plant on request . . . Write for technical booklet.

WALLERSTEIN COMPANY, INC. 180 MADISON AVENUE, NEW YORK 16, N. Y.

WHY USE 2 DE-SIZING AGENTS WHEN 1 WILL DO BOTH JOBS?

AMPROZYME

THE NEW DOUBLE-ACTION DE-SIZING AGENT CONVERTS BOTH STARCHES AND PROTEINS IMMEDIATELY AND IN ONE OPERATION

There is no need for two different de-sizing agents or for two different de-sizing operations when you use AMPROZYME. If the size is starch, its amylolytic enzymes go right to work. If a protein size is present, its proteolytic enzymes take up the attack. AMPROZYME digests either or both at the same time and in the same operation.

AMPROZYME, furnished in powder form, can be used at all normal dye box temperatures and in a wide pH range. Its rapid double-action insures quick and complete de-sizing of cottons, rayons and mixed goods, producing a good hand and fine finish for even dyeing without streaks, shading or blemishes.

When you use AMPROZYME you do more than effect economies in de-sizing operations. You reduce storage, handling and shipping costs as well, for you have one product that does two jobs. You're never out of the proper de-sizing agent with double-acting AMPROZYME.

Send the coupon today for full information on AMPROZYME and a sample for a test run. Why buy two products when one will do both jobs?

JACQUES WOLF & CO.
Chemicals PASSAIC, N. J.

Manufacturers of Monopole Oil, Superclear, Hydrosulfites, Oratol L-48, Lomar PW, and other chemical specialties

AMPROZYME AMPROZYME AMPROZYME AMPROZYME AMPROZYME

(AD 1-50)

JACQUES WOLF & CO., Passaic, N. J.

☐ *I want to know more about AMPROZYME.*

☐ *I would like sample for a test run.*

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY & STATE_____

INDIGOSOL* GOLDEN YELLOW IGK

. . . For Versatility

The present price of Indigosol Golden Yellow IGK makes possible the use of this very fast Indigosol for economical dyeing and printing operations. In combination with Indigosol Green IBA, very fast green shades are now available to the printer and dyer for the first time at a very reasonable cost.

An excellent printing color on cotton and rayon, it is also of great interest to the dyer of cotton, rayon and wool. In ease of application, the perfectly level shades obtained, and the unusually excellent penetration of heavy goods makes the entire line of INDIGOSOLS especially valuable to the fast color dyer or printer.

PHARMASOL* GOLDEN YELLOW N

. . . For Brightness & Economy

PHARMASOL Golden Yellow N produces clear, bright, fast and economical golden yellow shades when printed on cottons or rayons. When mixed with Pharmasol Red RN, a complete range of gold shades can be obtained.

PHARMASOLS are solutions of stabilized azoic dyes and adjusted to the most practical concentration which can be easily applied with a maximum of efficiency. PHARMASOLS solve the problem of troublesome dissolving and the uncertainties thereof — and as there is no decomposition there can be no loss of material or value.

Let Our Technical Staff Solve Your Problems

*Reg. U.S. Pat. Off.

CARBIC COLOR & CHEMICAL CO., INC.

451-453 Washington Street — New York 13, N. Y.

BRANCHES: Philadelphia, Pa. • Providence, R. I. • Charlotte, N. C. • Hamilton, Ont.

Importers of the Manufactures of Durand & Huguenin S.A. Basle, Switzerland

Representatives: Los Angeles (Hathaway Allied Products)

Exclusive Distributors of: Pharmasols, Pharmols, Pharmecines

AMERICAN

DYESTUFF REPORTER

Incorporating Textile Colorist and Converter

NORMAN A. JOHNSON
Editor

CHARLES A. WHITEHEAD
Managing Editor

MYRON D. REESER
Advertising Manager

HERBERT A. STAUDERMAN
Advertising Representative

GRACE B. BURTON
Production Manager

M. H. MORGAN
Circulation Manager

Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

•

Published every other Monday by the **HOWES PUBLISHING COMPANY, INC.**, One Madison Avenue, New York 10, N. Y **C. R. Howes,** President; **Harry F. Crawford,** Executive Vice-President; **Norman A. Johnson,** Vice-President; **Ernest J. Finan,** Treasurer; **Myron D. Reeser,** Secretary; **C. Essenbreis,** Assistant Secretary.

•

Also Publishers of
HOSIERY INDUSTRY WEEKLY
HOSIERY MERCHANDISING

•

JANUARY 9, 1950
VOLUME 39 NUMBER 1

Contents

Contents of previous issues can be found by consulting the Industrial Arts Index and the Engineering Index, Inc. at your library

• Departments

Trade Notes—New Products..... 29

• Proceedings of the American Association of Textile Chemists and Colorists

Noncellulosic Group:
Helindon Dyestuffs for Wool..... P2
Luttringhaus, Flint and Arcus

New York Section Meeting Date Changed.....P11

Employment Register P11

Auxiliaries and Testing Group:
Modification of Fiber and Fabric Properties by Wrinkleproofing and Stabilizing Agents.....P12
Gagliardi and Nuessle

Cellulosic Group:
Bleaching of Cotton — A Proposed Continuous Hypochlorite Bleaching Process.....P20
Seyb and Foster

LTI Student Chapter Meetings.....P26

Report of PTI Student Chapter.....P26

WNE Meeting Dates Approved.....P26

Report of WNE Section.....P26

Philadelphia Section Meeting Dates.....P26

Report of Utica Technical Institute Student Chapter..P26

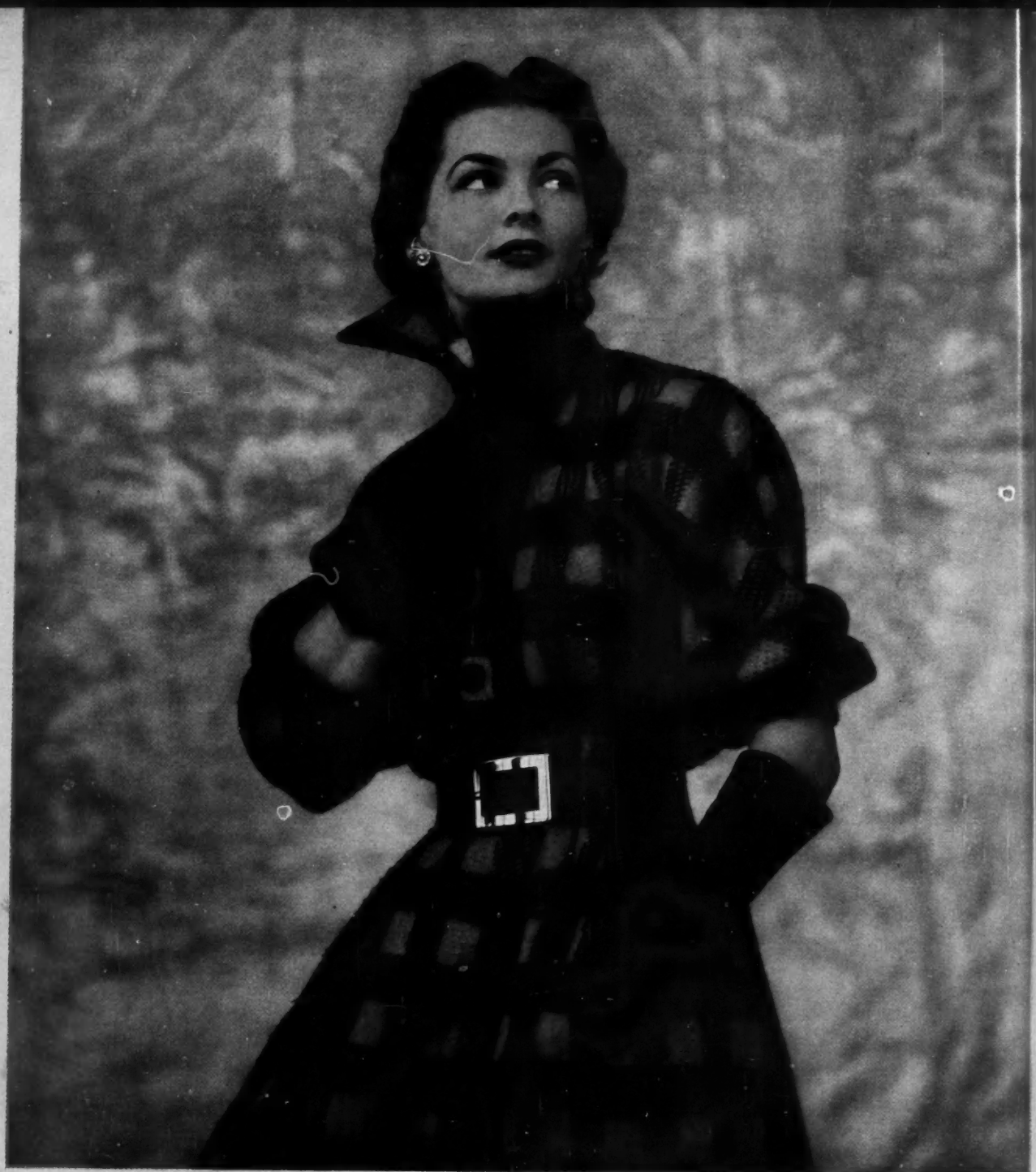
1950 Annual Meeting of Inter-Society Color Council.P27

Details of Piedmont Section Meeting.....P27

Membership Applications P27

Calendar P28

Copyright, 1950, Howes Publishing Co., Inc.



for **colors** *that move merchandise faster!*

National Aniline Dyes

NATIONAL ANILINE DIVISION • ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N.Y. BOSTON • PROVIDENCE • PHILADELPHIA • CHICAGO • SAN FRANCISCO • PORTLAND, ORE. GREENSBORO • CHARLOTTE • ATLANTA • NEW ORLEANS • CHATTANOOGA • TORONTO

Proceedings of the
American Association of Textile Chemists and Colorists

Copyright, 1949, American Association of Textile Chemists and Colorists

JANUARY 9, 1950

National Officers of the Association

President
C. NORRIS RABOLD
Erwin Cotton Mills Co.
Cooleemee, N. C.

Vice-Presidents
ARTHUR W. ETCHELLS
Hellwig Dyeing Corp.
Philadelphia, Pa.
GEORGE O. LINBERG
Monsanto Chemical Co.
Boston, Mass.

Treasurer
WILLIAM R. MOORHOUSE
National Aniline Division, Allied Chemical & Dye Corp., 150 Causeway Street, Boston 14, Massachusetts

Secretary
HAROLD C. CHAPIN
Lowell Textile Institute, Lowell, Massachusetts

Founder
LOUIS A. OLNEY
(Deceased)

Chairman of the Research Committee
J. ROBERT BONNAR
General Dyestuff Corp.,
435 Hudson Street, New York 14, N. Y.

Director of Research
HAROLD W. STIEGLER
Lowell Textile Institute, Lowell, Massachusetts

Councilors

Representing Sections

Rhode Island: GEORGE H. WOOD, JR., RAYMOND W. JACOBY, EDWARD J. ALLARD, ROBERT W. JOERGER.
Philadelphia: ONSLOW B. HAGER, M. H. KLEIN, FREDERICK W. TRAUT, JAMES DIXON, JACKSON A. WOODRUFF, WALTER F. FANCOURT, 3rd.
New York: PAUL J. LUCK, WILLIAM A. HOLST, JR., FRANCIS S. RICHARDSON, CHARLES W. DORN, HERMAN E. HAGER, HERMAN E. WILDE.
Northern New England: KENNETH R. FOX, JOHN M. GOULD, C. WENDALL LEVER.
Piedmont: JOHN B. NEELY, WYSS L. BARKER, PELHAM E. SMITH, SUMNER H. WILLIAMS.
Southeastern: A. KEMPTON HAYNES, WALTER M. SCOTT.
South Central: JACK ANDERSON.
Mid-West: FREDERICK E. HILGER, JOSEPH H. JONES.
Western New England: HAROLD H. TAYLOR.
Pacific Southwest: FRANK P. BRENNAN.
Hudson-Mohawk: ALBERT E. HERRMANN, JR.
Pacific Northwest: CHARLES K. BISHOP.

Past Presidents
ELVIN H. KILLHEFFER, P. J. WOOD, WILLIAM H. CADY, ALBAN EAVENSON, CARL Z. DRAVES, THOMAS R. SMITH, WILLIAM D. APPEL, HENRY F. HERRMANN.

Standing Committees of the Council and their Chairmen

Executive Committee on Research
J. ROBERT BONNAR, *Chairman*

Publicity
PAUL J. LUCK, *Chairman*

Conventions
KENNETH H. BARNARD, *Chairman*

Appropriations
WILLIAM R. MOORHOUSE, *Chairman*

Constitution and Bylaws
HAROLD C. CHAPIN, *Chairman*

Membership and Local Sections
JOHN N. DALTON, *Chairman*

Corporate Membership
LEONARD S. LITTLE, *Chairman*

Publications
PERCIVAL THEEL, *Chairman*

Technical Programs
ARTHUR W. ETCHELLS, *Chairman*

Local Sections and their Officers

Northern New England Section

Chairman
FRANK J. O'NEIL
Pacific Mills
Lawrence, Massachusetts

Secretary
AZEL W. MACK
Dexter Chemical Corp., 581 Boylston St., Boston 16, Massachusetts

Vice-Chairman — RALPH E. HALE
Treasurer — WILLIAM W. PENNOCK

Rhode Island Section

Chairman
ELLIOT BROADBENT
Glenlyon Print Works
Phillipsdale, R. I.

Secretary
EMORY A. RICHARDS
Airedale Worsted Mills, Inc., 1 Main Street, Woonsocket, Rhode Island

Vice-Chairman — PETER G. KOLUPAEV
Treasurer — ROBERT R. FARWELL

New York Section

Chairman
CHARLES W. DORN
J. C. Penney Co., 330 West 34th Street, New York 1, N. Y.

Secretary
NORMAN A. JOHNSON
American Dyestuff Reporter, One Madison Ave., New York 10, N. Y

Vice-Chairman — PAUL J. LUCK
Treasurer — JOHN H. HENNESSEY

Philadelphia Section

Chairman
RICHARD B. STEHLE
Allegheny Dye Works
Trenton & Allegheny Aves., Philadelphia 34, Pa.

Secretary
THOMAS H. HART
Hart Products Corp., P. O. Box 5020
Philadelphia 11, Pennsylvania

Vice-Chairman — A. E. RAIMO
Treasurer — EDWARD C. DIEHL

Piedmont Section

Chairman
ROBERT H. SMITH
High Point Chemical Mfg. Co.
High Point, N. C.

Secretary
W. CHESTER COBB
Arnold Hoffman & Co., Inc.
2130 N. Tryon St., Charlotte, N. C.

Vice-Chairman — EDWIN A. BRIGGS
Treasurer — R. HOBART SOUTHER

South Central Section

Chairman
JOSEPH H. O'NEILL
Riegel Textile Corp.
Trion, Ga.

Secretary
CHARLES P. GORDON, JR.
Riegel Textile Corp.
Trion, Ga.

Vice-Chairman — WILLIAM T. EVANS
Treasurer — EVERETT E. BURGNER, JR.

Mid-West Section

Chairman
ELLIOTT MORRILL
The Best Foods, Inc., 1436 West Morris St.
Indianapolis, Ind.

Secretary
JOHN E. A. SCHRODER
General Dyestuff Corp., 731 Plymouth St.
Chicago 5, Ill.

Vice-Chairman — LEONARD J. ARMSTRONG
Treasurer — TOM LATHAM

Southeastern Section

Chairman
H. GILLESPIE SMITH
Calco Chemical Div.
American Cyanamid Co.
Atlanta, Ga.

Secretary
R. E. HUDSON, JR.
Southern Research Institute
91 South 20th St., Birmingham, Ala.

Vice-Chairman — S. JACK DAVIS
Treasurer — ADAM FISHER, JR.

Western New England Section

Chairman
J. EDWARD LYNN
American Cyanamid Company
Stamford, Connecticut

Secretary
ARTHUR S. NYQUIST
American Cyanamid Co.
Stamford, Conn.

Vice-Chairman — RAYMOND J. CAREY
Treasurer — ROBERT N. BROWNLEE

Pacific Southwest Section

Chairman
H. A. DES MARAIS
General Dyestuff Corp., 37 Clementina St
San Francisco 5, California

Secretary
FREDERICK L. WILHELM
American Aniline Products, Inc.
2313 East Eighth St., Los Angeles 21, California

Vice-Chairman — RUSSELL B. COLEMAN
Treasurer — CHARLES H. DUNKER

Hudson-Mohawk Section

Chairman
DAVID O. HAMER, JR.
Arkansas Co., Inc., P.O. Box 37
Tribes Hill, N. Y.

Secretary
WILLIAM A. NELSON
Ritter Chemical Company, Inc., 403 W. Main St., Amsterdam, New York

Vice-Chairman — JOHN J. HANLON
Treasurer — IRWIN J. SMITH

Pacific Northwest Section

Chairman
EARL B. BREARLEY
Jantzen Knitting Mills, 411 N.E. 19th Ave
Portland 14, Ore.

Secretary
ROBERT M. TRUE
General Dyestuff Corp., 1102 Terminal Sales Bldg
Portland 5, Ore.

Vice Chairman — OTTO E. SCHMIDT
Treasurer — WILLIAM C. MARSHALL

STUDENT CHAPTERS: LOWELL TEXTILE INSTITUTE, NORTH CAROLINA STATE COLLEGE, PHILADELPHIA TEXTILE INSTITUTE, NEW BEDFORD TEXTILE INSTITUTE, GEORGIA INSTITUTE OF TECHNOLOGY, CLEMSON COLLEGE, BRADFORD DURFEE TECHNICAL INSTITUTE, UTICA TECHNICAL INSTITUTE

Noncellulosic Group—

HELINDON DYESTUFFS FOR WOOL*

H. LUTTRINGHAUS, J. E. FLINT and A. A. ARCUS
General Dyestuff Corporation

Introduction

HELINDON dyestuffs are vat colors especially selected for their suitability for the dyeing of wool. They are applied from a weakly alkaline bath at about 120 to 140°F. for approximately 30 minutes. During this process the wool does not lose any elasticity or strength. In order to show the need for such dyestuffs and also to demonstrate that we are not unduly conservative in advocating the use of these brands only, we must draw comparisons between these and the common anthraquinones.

Recent publications *(1), (2)* advocate the use of the regular cotton dyeing anthraquinone vat colors for the dyeing of wool. Temperatures ranging from 90° to 140°F. are recommended, the lower temperatures, of course, being preferable since in all cases high amounts of caustic soda are used, the concentration of caustic soda being as high as 0.75 ozs./gal. At a liquor ratio of 1:15 this would constitute about 8.4% dry caustic on the weight of the wool. No provision is made for cases where a short liquor ratio cannot be maintained, and it is not taken into consideration that the wool can absorb large quantities of caustic soda from a longer bath. If we have a liquor ratio of 1:30, and we cannot consider this out of line, the above mentioned amount of caustic soda increases to almost 17% on the weight of wool.

Even if the wool dyer knows that this amount of caustic soda is partly taken up by the vat dyestuff and partly neutralized by decomposition products of sodium hydrosulfite in the dyebath, he will hesitate to submit wool to a procedure which does not exclude the possibility of damage.

In the following we shall try to explain why we do not adhere to such dyeing methods and shall make an attempt to prove that a better method exists for the dyeing of vat colors on wool firmly based on theoretical considerations as well as on practical experience.

* Presented at the Noncellulosic Group Meeting, Atlantic City Convention, October 14, 1949.

Dye Comparisons

In order to explain our point of view we feel that it is necessary to compare the dyeing of cotton with the dyeing of wool. In studying the exhaustion of vat colors on cotton, we find that Indigo exhausts only about 40%, while Tetrabrom-Indigo, Indanthrene Red Violet RHA and Helindon Orange R exhaust about 65%, Indanthrene Yellow GA 85% and Indanthrene Dark Blue BO even up to 95%.

Rinsing before oxidation removes most of the indigo from cotton while leucoflaventhrone and leuco-violanthrone lose very little in such an operation.

It has been shown *(3), (4)* that the different exhaustion and fastness properties of the leuco compounds are related to the degree of dispersion of the dyestuffs in the vat; the higher the dispersion, the lower is the exhaustion on cotton. Since Indigo is predominantly in molecular dispersion its exhaustion is low, while types in colloidal dispersion like Indanthrene Blue RS exhaust very well on cotton.

It has also been established *(3)* that these rules are not valid for wool and that the relations between dispersion of leuco vat dye and its exhaustion properties are reversed in the case of wool. This means that molecular dispersed indigo exhausts much better on wool than Indanthrene Blue RS or any other leuco compound which is in colloidal dispersion.

If we dye wool with a common anthraquinone like Indanthrene Blue GCDF Paste with different amounts of caustic soda, we obtain different degrees of exhaustion. Thus, when we used 1% caustic soda, calculated on the weight of the wool, all the dyestuff which had superficially precipitated was washed off. At 2% there was no affinity either, and at 4% very little. Only when the amount of caustic was increased above 6%, was Indanthrene Blue GCDF Paste partly fixed on the wool. A perfect fixation was obtained only when 10% of caustic soda on the weight of the wool was used. The liquor ratio for these dyeings was 1:40 and the hydrosulfite—caustic soda relation was kept constant. When dyeing under the same conditions at a liquor ratio of 1:20, the fixation occurred at 4% caustic since this amount gave a greater concentration of alkali at the lower liquor ratio. It is interesting to note that the 10% caustic produced a much stronger dyeing at a liquor ratio of 1:20 than at 1:40. (Fig. 1).

Since all high-molecular vat colors are not easily soluble, they need a high concentration of sodium hydroxide. When the amount of alkali is too low the sodium salt of the leuco compound is changed by hydrolysis into the free leuco compound, the "vat acid" which, generally speaking, does not have any affinity. In the case of Indanthrene Blue brands we obtain a rearrangement of the leuco compound in an oxyanthrol which does not exhaust either.

It can be plainly seen from the exhibited samples in Fig. 1 that the exhaustion of Indanthrene Blue GCDF Paste increases with increasing amounts of caustic soda.

However, when dyed with indigo powder under the same conditions, entirely different results were obtained. The lower the alkali content of the dyebath, the better the exhaustion. As a matter of fact, when the caustic soda was reduced to 0.5% on the weight of the wool, the dyeing seemed to have reached the maximum depth while a higher amount of caustic decreased the exhaustion.

Fig. 2 shows the corresponding dyeings using Indanthrene Brilliant Green BN and Helindon Green BD. Increasing amounts of alkali increases the affinity of Indanthrene Brilliant Green BN, while the exhaustion of Helindon Green BD is not influenced.

Fig. 3 shows the same as Fig. 1 when Indanthrene Red FBBA and Helindon

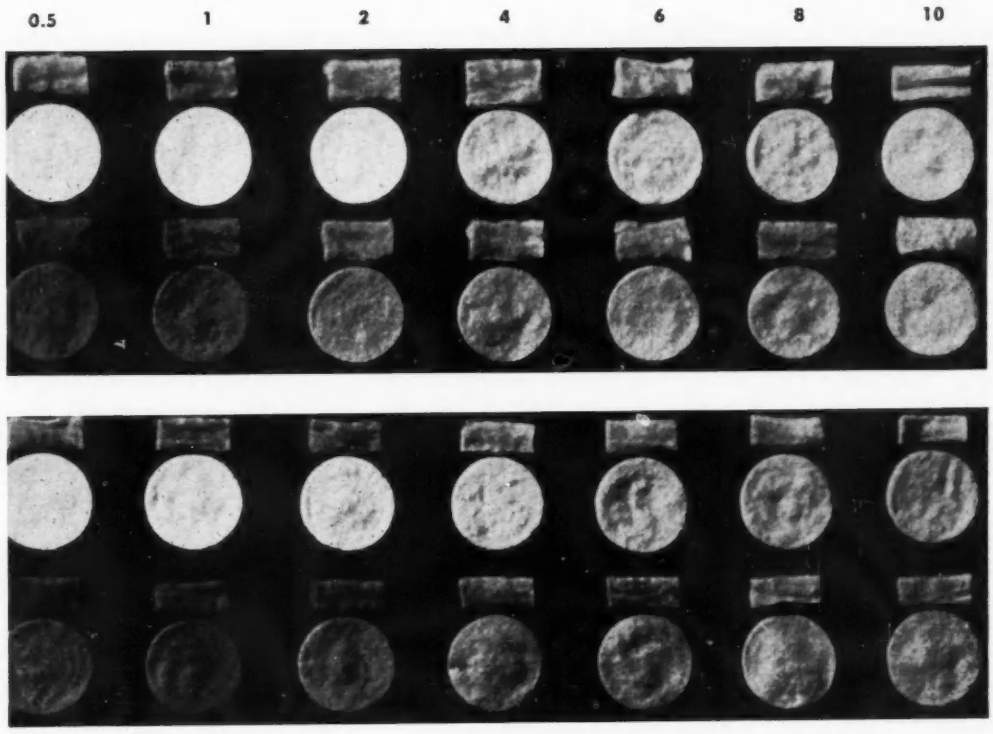

% Caustic Soda
0.5
1
2
4
6
8
10
4% Indanthrene Blue GCDF
1:40
1% Indigo
4% Indanthrene Blue GCDF
1:20
1% Indigo

Fig. 1

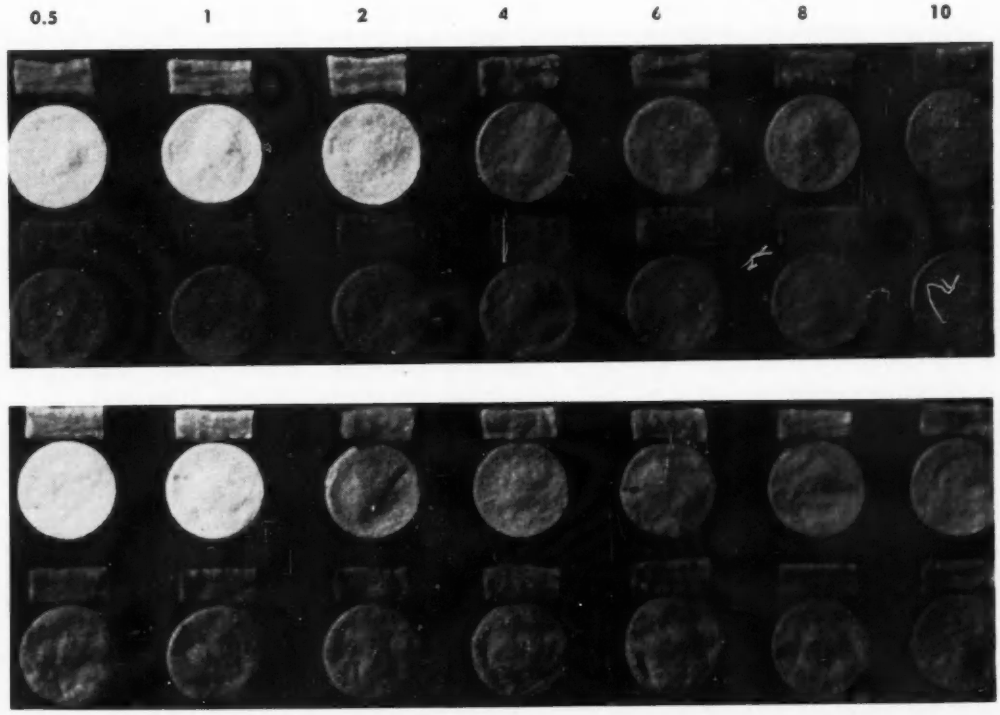

% Caustic Soda
0.5
1
2
4
6
8
10
4% Indanthrene Brilliant Green BN
1:40
3% Helindon Green BD
4% Indanthrene Brilliant Green BN
1:20
3% Helindon Green BD

Fig. 2

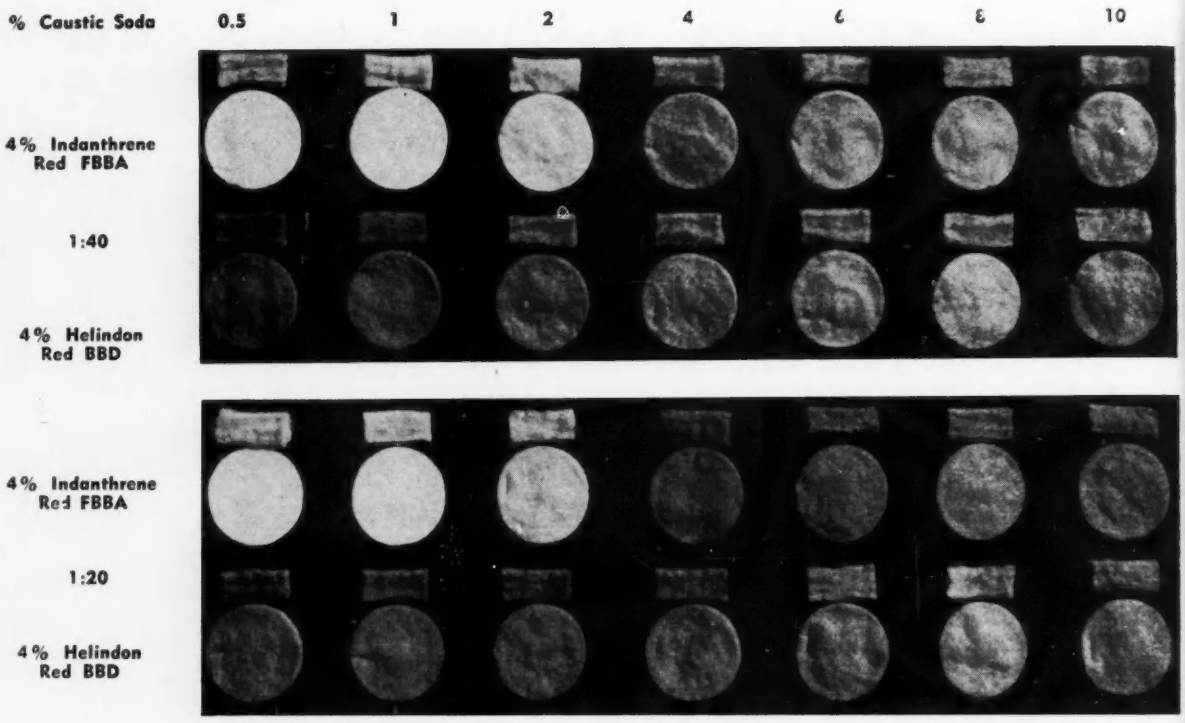


Fig. 3

Red BBD were used. The exhaustion of the Indanthrene increases with increasing amounts of caustic, while the exhaustion of Helindon Red increases with decreasing amounts.

Aspects of Dispersion

It would be interesting to know why this is so. In order to explain this several aspects in measurement of dispersion of dyestuffs must be consideerd. Auerbach *(5)* carried out diffusion tests based on investigations by R. O. Herzog and A. Polotzky *(6)*. In Auerbach's experiments the dyestuff diffused from a watery solution into a gelatin of 4% concentration. Auerbach did not measure the total diffusion, but he determined that point in the gelatin where the concentration of the diffused dyestuff was one tenth the concentration of a watery solution used for comparison. The distance of this point from the gelatin meniscus is called the diffusion distance, 1-1/10. Since the diffusion coefficient of some dyestuffs had been determined experimentally, it was possible for Auerbach to calculate the degree of dispersion of these dyestuffs with the diffusion formula of A. Einstein *(7)*:

$$D = \frac{RT}{N} \cdot \frac{1}{6\,r \cdot \pi \cdot \eta}$$

In this formula "D" is the diffusion coefficient, "R" the gas constant, "T" the absolute temperature, "η" the viscosity, "r" the radius of the particle (which is assumed to be in a spherical form) and "N" Avogadro's number.

By this method Auerbach determined that the particle size of Crystal Violet is 0.74 mμ. Auerbach also found that the diffusion distance, 1-1/10 (for a 4% gelatin at 20°C.), is in direct relation to the degree of dispersion of the dyestuff. This led to the discovery that 4% gelatin is impermeable to particles larger than 3.5 mμ.

Based on these results A. Schaeffer made very interesting investigations *(3)*, *(8)* of the dispersion of vat volors. Schaeffer carried out diffusion tests of many leuco compounds of vat colors by ultrafiltration, dialysis and also by diffusion into gelatine at 20°C., and he found that the vat dyes can be separated into 3 groups according to the dispersion of their leuco compounds, as follows:

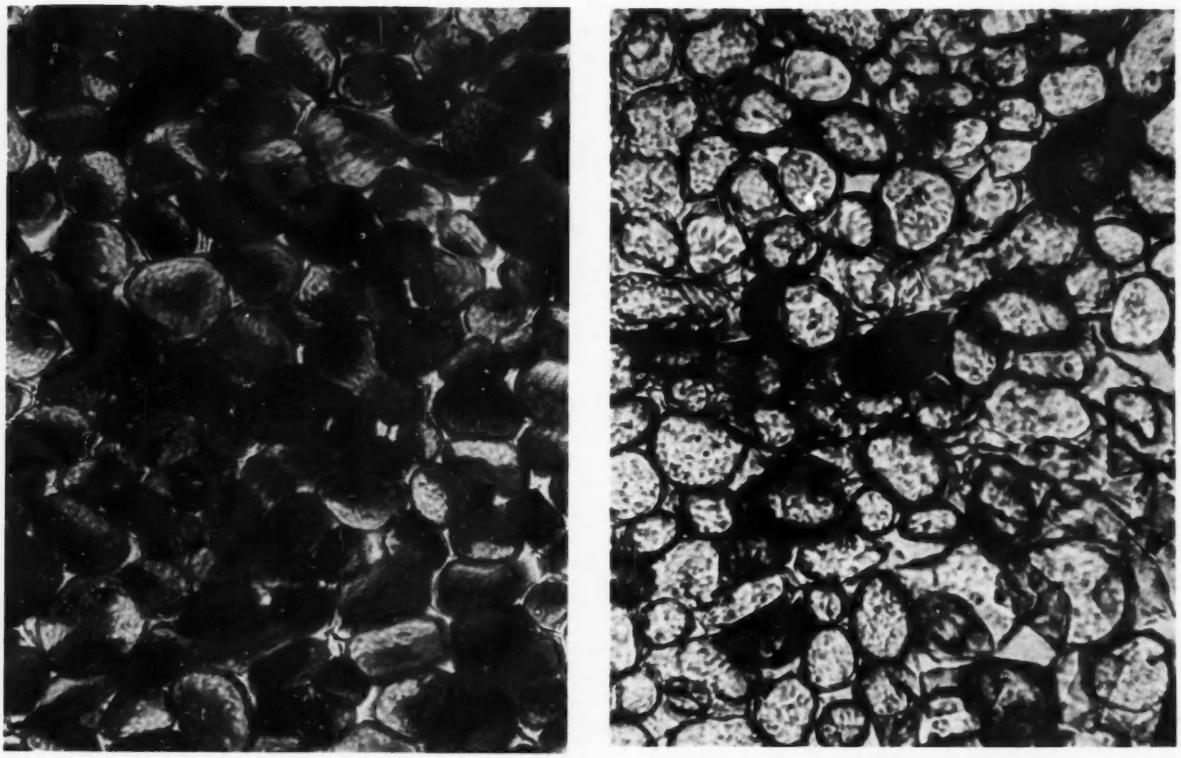
1. Types which are in molecular solution, like indigo and thioindigo. The particle size of their leuco compounds is not much larger than Crystal Violet or Patent Blue V. Benzolaminoanthraquinones, which belong to the cold dyeing types are also listed in this group.

2. Types like Brilliant Indigo 4B, Indanthrene Red Violet RHA and Helindon Orange R, the leuco compounds of which form semicolloidal solutions. The particle size of these leuco compounds comes close to 3.5 mμ since the diffusion is limited.

3. Types like Indanthrene Yellow G and Indanthrene Dark Blue BO, the leuco compounds of which are in colloidal dispersions. Since these products do not diffuse into gelatin, the particle size must be greater than 3.5 mμ.

Schaeffer's diffusion tests showed that indigo diffused to about the same degree as the molecular Crystal Violet, while the colloidal Congo Red acted similar to Indanthrene Dark Blue BO and did not diffuse at all into gelatin.

In order to show the similarity between gelatin and wool, we immersed wool in 1% solutions of Crystal Violet and Congo Red and left them undisturbed at room temperature for one month. Thereafter we found from cross sections of the wool that less than 1% of the fibers were fully penetrated by Congo



Crystal Violet

Congo Red

Fig. 4.

Red, about 15% were ring-dyed and 84% showed so little penetration that they appeared white under the microscope. In the case of the Crystal Violet, which was shown to be molecularly dispersed, most fibers were penetrated.

These diffusion tests into wool, therefore, show similar results as the diffusion into gelatin.

Valko *(9)* studied the diffusion of cold dyeing types of anthraquinones. He found that on the average three dyestuff anions form one particle.

Vasiliev and Deshalyt *(10)* have also investigated dyestuffs of the cold dyeing type and found them to be in monomolecular form.

These findings confirm Schaeffer's results on diffusion in that the cold dyeing vat colors diffuse rapidly, thus indicating a low particle size. Therefore, it is logical to look for suitable vat colors for wool among the cold dyeing types.

The excellent investigations of the above mentioned chemists give us a clear picture of the particle sizes of vat colors in solution. However, these investigators carried out their diffusion tests at low temperatures. Valko, testing only cold dyeing types, made measurements within the range of the dyeing temperature. Schaeffer could not go above 20°C. because the gelatin would melt above that temperature. It must be mentioned, however, that Schaeffer measured dispersion also at the dyeing temperature by ultrafiltration and by dialysis.

Since diffusion rate is the most suitable measure for particle size of a dyestuff in solution, we ourselves have worked out a method by which it is possible to measure diffusion at the dyeing temperature. We did not carry our experiments to the point where we could calculate the particle size, but we obtained quantitative results with a device which made it possible to measure the diffusion accurately to 1/1000 of an inch.

We have not only confirmed Schaeffer's results, but we were also able to establish why Indanthrene Blue GCDF dyes wool better with a higher amount of alkali as shown by our dyeings (Fig. 1).

We found that the diffusion of Indanthrene Blue GCDF is accelerated to the degree of an indigoid type when we increase the caustic from .65 to 1.3 oz. per gallon. This shows that the particle size of Indanthrene Blue GCDF is decreased by additional caustic soda. But in the presence of wool the high amount of caustic soda has a twofold action. It not only reduces particle size, but it also swells the wool and opens its submicroscopical pores enough to let the high molecular type of dye penetrate. It must be the combined action of the two phenomena which results in a dyeing of Indanthrene Blue on wool.

Diffusion Test Description

A series of diffusion experiments were made to determine what physical differences there might be between Indanthrene and Helindon dyestuffs. Initial trials were made following the gelatin-diffusion methods of Schaeffer and Auerbach; next, the porous glass disc method of McBain and Liu *(14)* and Valko *(9)*; and last, the microcell free-diffusion method of Fuerth and Ullmann *(15)*. A modified all-glass Fuerth cell proved to be the most suitable for our use, because of its ease of construction, control of temperature, relatively short time of observation, and reproducibility of results. Its construction and operation follow. A test tube four inches long with a quarter-inch bore is filled with the reduced vat.

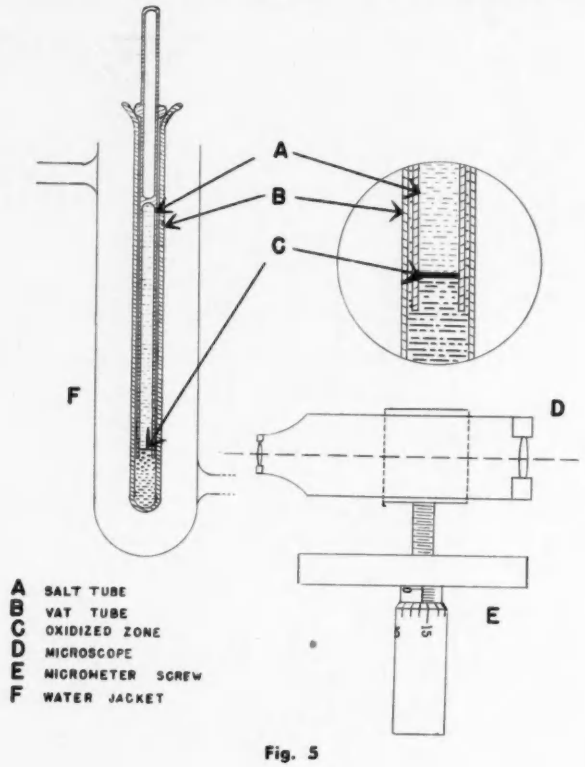


Fig. 5

Into this, in an inverted position, a three-inch glass tube, sealed at one end and containing a salt solution is slowly inserted. The smaller tube supports itself by a flange which prevents the lower end from touching the bottom of the vat tube and at the same time seals the vat liquor from atmospheric oxidation. (Fig. 5). The system is supported vertically and enclosed in a water jacket to maintain the desired temperature. Through the mouth of the smaller tube the reduced vat diffuses upward, and at the intersurface of the two solutions a well-defined narrow zone of oxidized vat is formed as originally described in Schaeffer's gelatin-diffusion experiment. This zone advances by repeated oxidation and reduction, and remains reasonably sharp for the duration of the experiment which is fixed here at three hours. The rate of diffusion is obtained by periodic readings through a measuring microscope placed in front of the tube. This apparatus measured diffusion distances to 1/1000 of an inch.

Each experiment was performed as illustrated by the method for indigo which follows: 0.25 grams of indigo was vatted with 1 c.c. of Monopol Oil, 1 gram of caustic soda and 1 gram of hydro in 100 ml. of water at 150°F. The resulting vat was then diluted to 200 ml. with a solution containing 2 ml. of ammonia and 2 grams of hydro per liter. A sample of the reduced vat was placed in the larger test tube. In the smaller tube was placed a .015 molar salt solution, which was necessary to stabilize the salt effect of the electrolytes contained in the leuco vat. Throughout the experiments with anthraquinones, potassium persulfate was the principal salt used to form the desired zone since an oxidizing salt was necessary to make the oxidizing zone sufficiently visible. Dissolved air in a common salt solution was sufficient for the Helindons. The distances through which the zone moved during the course of the experiment were recorded and diffusion curves drawn.

Comparisons were run between Helindons and Indanthrenes as follows:

Indigo vs.
Indanthrene Blue G C D F Paste
Helindon Green BD vs.
Indanthrene Brilliant Green BN
Helindon Red BBD vs.
Indanthrene Red FBBA

The remaining Helindons were tested in like manner (see Fig. 6, 7, 8 and 9).

The concentration of the dye was adjusted in each case to 0.0043 molar so as to correspond to the concentration employed for indigo. The Indanthrenes were

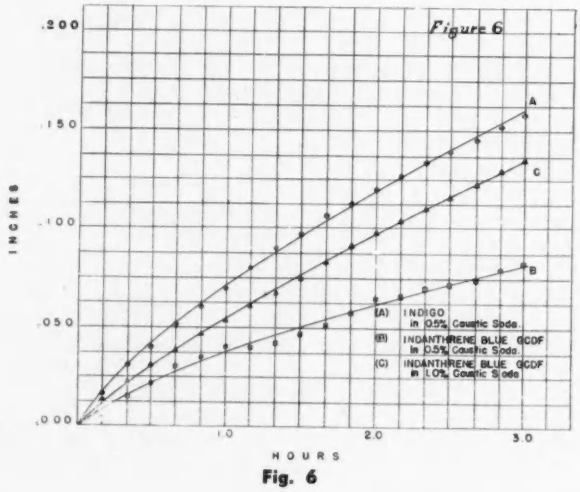


Fig. 6

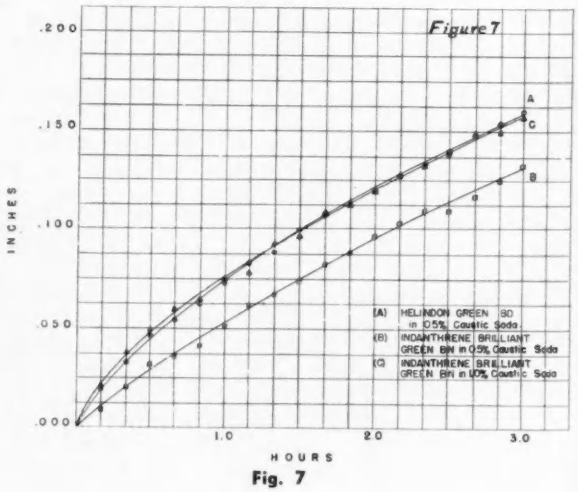


Fig. 7

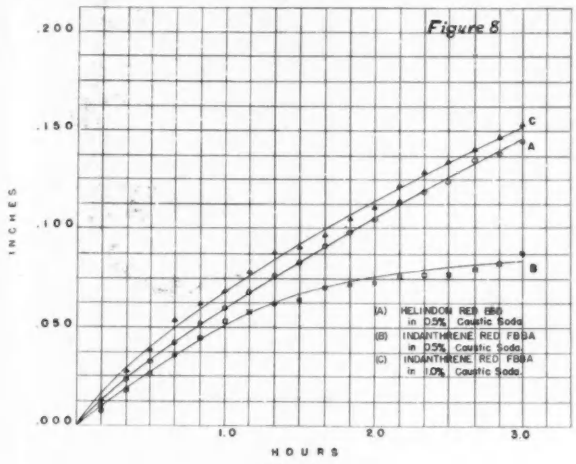


Fig. 8

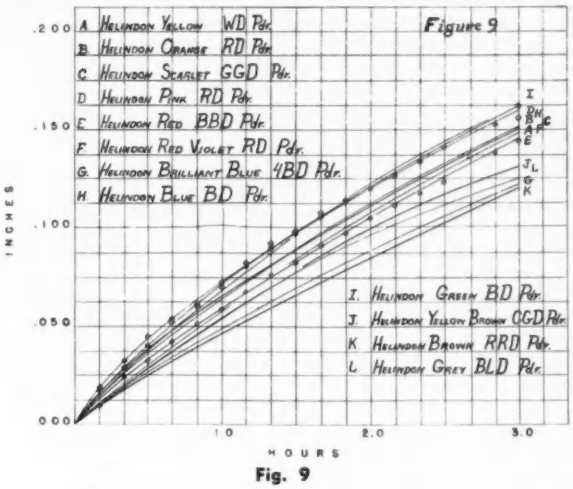


Fig. 9

tested under two conditions; namely, vatted with 1 gram of caustic soda for 200 ml. (or .685 ozs./gal.) and with 2 grams of caustic soda respectively for 200 ml. (or 1.37 ozs./gal.) keeping other conditions the same. Where twice the amount of caustic soda was used, a molar equivalent amount of sodium chloride was added to the potassium persulfate solution to maintain the original electrolyte equilibrium.

Results

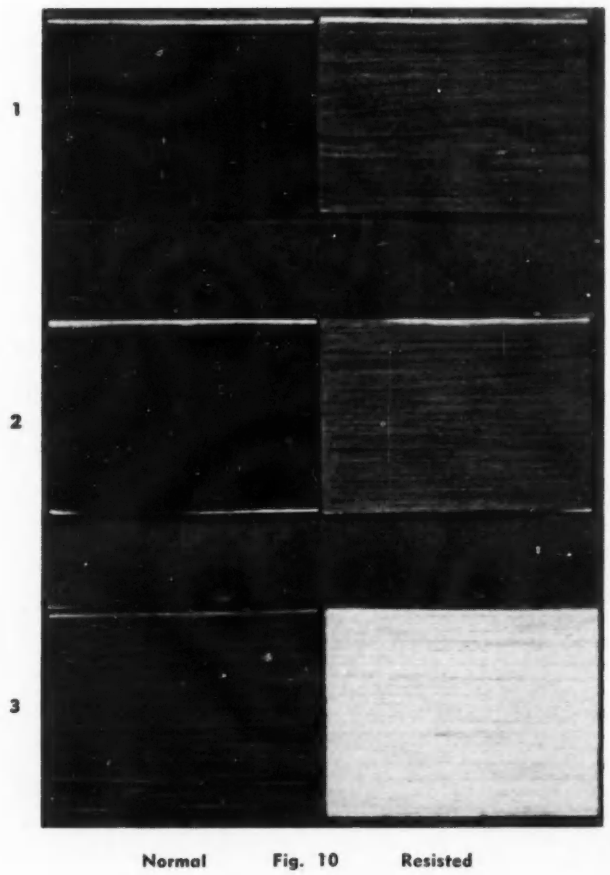
The resulting curves (see Figures 6, 7 and 8) prove to be highly significant in many respects. First it is to be noted that the initial portion of the curves are subject to various errors before equilibrium conditions and a steadily moving zone is obtained. Steady diffusion sets in after about 30 minutes.

Returning now to our dyeing experiments we see again from Fig. 1 that 10% of caustic is sufficient to fix Indanthrene Blue GCDF at a liquor ratio of 1:40, but the same amount of caustic at a shorter liquor ratio produces a heavier dyeing. The dyeing is strong and the wool is dead.

From all tests it can be seen that the high amount of alkali makes dyeing of anthraquinones possible, and it is this excess alkali which is so dangerous for wool. If we read about the dyeing of indigo on wool, we are usually informed that the reduced indigo penetrates through pores into the wool. We are told, however, that in the reduced state no fixation takes place and that fixation occurs only after oxidation.

Leupin and Hartmark *(11)* offer a better explanation. When Indigo is reduced with hydrosulfite and caustic soda there is first obtained the sodium salt of indigo white which dissociates into sodium and indigo white-ions. Electrometric titration showed that indigo white is a weak acid and, therefore, we have to assume the following equilibrium in the vat:

$$\text{Indigo white} \cdot Na + H_2O \rightleftharpoons \text{Indigo white} \cdot H + Na^{+} + OH^{-}$$



Normal Fig. 10 Resisted

1. 1% Indigo.
2. 4% Helindon Green BD.
3. 1% Alizarine Blue SAP.

The indigo white-acid reacts with the wool like an acid dyestuff and saturates a certain amount of basic groups in the wool.

Indigo white · H + Wool ⇌ Indigo white—wool salt

An indigo white-wool salt is formed which cannot be oxidized to the original vat dyestuff as the Indigo white · Na. It is split by hydrolysis into indigo white-acid and regenerated wool. Then the indigo white is oxidized on the wool to indigo. It is, therefore, really the vat acid which exhausts on the wool.

If indigo really exhausts on wool like an acid color, resisted wool should no longer enter into chemical combination with indigo. To show that this is so, we have dyed resisted wool in the same vat with normal wool.

It can be seen from this experiment (Fig. 10) that indigo dyes the resisted wool only about 25% as heavily as normal wool. This indicates that the dyeing of indigo on wool is principally a chemical combination with wool and not merely an adsorption as on cotton. During an adsorption it is the sodium salt of the leuco compound which exhausts on the fiber *(12)*. It is not maintained that the principle of adsorption is entirely eliminated on wool. Some adsorption is taking place at the same time. This can be seen from these dyeings on resisted wool where it is not dyed by an acid dye such as Alizarine Blue SAP, whereas with indigo 25% of the dye does go on. (Fig. 10).

A similar dyeing on resisted wool is obtained with other types which are fixed with very low amounts of alkali. For instance, Helindon Green BD dyes resisted wool only to about ¼ the depth of normal wool, indicating that it reacts with wool in the same way as indigo.

Let us now go one step further. Since Helindon Green BD dyes with a small amount of caustic, the particle size of its free leuco acid must be small enough to diffuse into wool. If we prepare an acid vat in the usual way and dye Helindon Green BD in this vat, we should obtain a dyeing without the help of any alkali. As a matter of fact, such a dyeing can be carried out just as well at a pH of 3 as at a pH of 6. Indanthrene Brilliant Green BN, however, cannot be fixed on wool at a pH below 7.

Fig. 11 shows pads made from dyeings of these colors from an acid vat. In the case of Helindon Green BD, fixation is obtained, while a pad made from a dyeing of Indanthrene Brilliant Green BN is practically colorless.

Trying this principle in practice, we prepared an acid vat in a special way, padded wool flannel with this acid vat and ran the material immediately into boiling phosphoric acid for a very short time.

In 2½ minutes a 60 yard piece was dyed with vat colors (without use of any alkali) which withstood 4½ hours fulling as well as a regular vat dyeing. This mill trial should prove definitely that the leuco compounds of some vat colors form a chemical combination with wool.

The question now arises "Which are these vat colors?" It is clear that they are the types that form molecular or near-molecular solutions of the leuco compound.

That the size of the molecule also plays an important part can be illustrated with corresponding leuco esters, the Algosols. We know that at the boiling point even colloidal types like the anthraquinones are in molecular dispersion. If a fleece is dyed at the boil with an Algosol derived from an anthraquinone, the dyeing turns out to be tippy because a large molecule of this type prefers to enter wool on the damaged part first. An indigoid type, however, does not show this preference since the size of its molecule is small enough to penetrate the wool fiber everywhere. Therefore, the indigoid type dyes tippy wool level.

Fig. 11
Dyed from an Acid Vat at a pH of 5.0.
1. Indanthrene Brilliant Green BN.
2. Helindon Green BD.

Fig. 12
Tippy Wool.
1. Algosol Blue IBC.
2. Algosol Blue 04B.
3. Algosol Red IFBB.
4. Algosol Pink IR Fine.

TABLE I

	Dyestuff lbs.	Monopol Oil 48% lbs.	Water gallons	Caustic soda (dry)	Hydrosulfite conc.	Temperature of the stock vat °F.	Appearance of the Stock vat Glass slide test
Helindon Yellow 6GD Powder	1	¼	1-2	4 ozs.	4 ozs.	100°F.	Brown, turning slowly yellow
Helindon Yellow WD Powder	1	¼	1-2	4 ozs.	6 ozs.	160°F.	Dull yellow, turning quickly golden yellow
Helindon Orange RD Powder	1	¼	1-2	4 ozs.	5 ozs.	175°F.	Greenish yellow, turning slowly orange
Helindon Scarlet GGD Powder	1	¼	1-2	3 ozs.	5 ozs.	130°F.	Blue Violet, then claret to brick colored
Helindon Pink RD Powder	1	¼	1-2	9 ozs.	7 ozs.	175°F.	Pale yellow, turning quickly pink
Helindon Red BBD Powder	1	¼	1-2	3½ ozs.	8 ozs.	130°F.	Yellow, turning quickly red
Helindon Red Violet RD Powder ..	1	¼	1-2	8 ozs.	8 ozs.	175°F.	Yellow, turning slowly red violet
Helindon Brilliant Blue 4BD Pdr...	1	¼	1-2	3½ ozs.	4 ozs.	150°F.	Golden Yellow, turning slowly green and then blue
Helindon Blue BD Powder	1	¼	1-2	2 ozs.	4 ozs.	130°F.	Greenish yellow, turning quickly blue
Helindon Turquoise Blue G Powder.	1	¼	1-2	4 ozs.	4 ozs.	100°F.	Purple, turning brown and then blue
Helindon Green BD Powder	1	¼	1-2	4 ozs.	11 ozs.	160°F.	Yellow Olive, turning quickly green
Helindon Yellow Brown CGD Powder	1	¼	1-2	3 ozs.	6 ozs.	170°F.	Yellow, turning quickly brown
Helindon Brown RRD Powder	1	¼	1-2	7 ozs.	7 ozs.	160°F.	Yellow Olive, turns slowly brown
Helindon Grey BLD Powder	1	¼	1-2	4 ozs.	4 ozs.	150°F.	Golden Yellow, turning quickly grey

Helindons

Fig. 12 shows the anthraquinone type Algosol Blue IBC, the indigoid Algosol Blue O4B, the anthraquinone type Algosol Red IFBB, and the indigoid Algosol Pink IR Fine. The two anthraquinone types dye the fleece tippy and the indigoids dye it level.

From these studies we have learned that it is not necessary to submit wool to a doubtful operation which might change its character through exposure to high amounts of alkali. We have only to make the correct selection of vat colors. As a matter of fact, such a selection was made many years ago. These products were on the market under the name of Helindons. Schaeffer has given ample explanation as to why these types are especially suited for wool *(3)*. When Helindons disappeared from the market during the war years it was not astonishing that anthraquinones were tried and recommended. However, the newly developed dyeing methods for the common anthraquinones have led to their adoption in only a very few mills. We know that many pounds of wool have been dyed with anthraquinones, but we are certain that this wool would have been in much better condition if it had been dyed with Helindons. We have only to consider the parallel dyeings shown in Figs. 1, 2 and 3 with the increasing amounts of alkali to understand the entire situation. Can there be anything more diametrically opposite than the dyeings of Indigo and Indanthrene Blue GCD? The high amount of alkali required for the latter is bound to swell the fiber beyond the point where the swelling is no longer reversible, at least when it is submitted to this amount of alkali over a period of 30 minutes or longer. Wool dyed with anthraquinones does not always have to show a lower tensile strength, but everybody who has dyed wool in this way must admit that such wool acquires that peculiar scroopy and lifeless feel. If such wool is mixed with other fibers that conveniently hide its quality, no harm is done, but it is not possible to produce high-class material if the wool has lost its original elasticity.

The research on the relation of particle size to wool dyeing can be summarized with a homely figure of speech: "You cannot put a nickel into a 10c slot machine without breaking the machine".

With the demand for faster colors it seemed necessary for us to revive and extend the line of Helindon dyestuffs. Therefore, it is a special privilege for us to announce a new line of these dyestuffs. We call it a new line because among old established dyes we are offering the following new types: Helindon Yellow WD, Helindon Yellow 6GD, Helindon Yellow Brown CGD, Helindon Turquoise Blue G and Helindon Grey BLD. Because of the wool dyers' aversion to pastes, the Helindons are being placed on the market in powder form. In former years some of the Helindons were available in reduced form as vat powders. Since it was never possible to prepare all of them as vat powders, and since vat powders are subject to deterioriation, we did not think it advisable to bring out any of our Helindons in reduced form.

We would like to point out that our diffusion experiments (Fig. 6, 7, 8 and 9) show that all these Helindons diffuse nearly as well as indigo, thus indicating their small particle size and general suitability for the dyeing of wool.

Table I lists our Helindon colors and shows the necessary amount of chemicals and optimum conditions for preparing their stock vats.

While Table I lists the optimum conditions of vatting for each dyestuff, we have found that most products can be vatted together and all can be dyed together. In dyeing we do not make any distinction between so called HW and HN dyers. All this can be taken care of by regulating the dyeing temperature from 120 to 140°F. within about 20 minutes. After 30 minutes the dyeing is usually completed. If the exhaustion is not satisfactory after this time, we add from 1 to 4% ammonium sulfate to lower the pH of the dyebath to about 8.5. This used to be the empirical rule years ago, but as a result of Leupin and Hartmark's research on the chemistry of the dyeing of indigo we know now why it is correct to make this addition.

The dyebath is set with ammonia and hydrosulfite. For heavy shades we sometimes omit even the ammonia, as the small amount of caustic soda carried over from the stock vat assures sufficient alkalinity. For pastel shades we use 3% ammonia to retard the exhaustion. In principle we increase the hydro with increasing amounts of ammonia, but somewhat lower amounts of hydro can be used in easy flowing machines, and increased amounts when air is carried in by turbulance. The amount of ammonia is not increased with longer liquor ratios; all chemicals are calculated on the weight of the wool.

We add, in most cases, 2% of glue to the dyebath. This addition is not made merely because it was done 25 years ago. Glue retards the exhaustion of the Helindons and might prevent the precipitation of the vat if it should be on the verge of

falling out. But glue, like all albumen decomposition products, also acts as a buffer by forming a sodium salt with the caustic and thus lowering the pH of the bath *(13)*.

After the dyeing operation the wool is hydroextracted, oxidized in the air and acidified with 1% acetic acid 58% while the bath is brought up to 170°F. Tops can be cooled, oxidized and acidified in the machine without being removed.

Thus we dye wool with vat colors under conditions which are less severe than those in an alkaline scouring bath. For us it is not a question whether the tensile strength of the wool is within acceptable limits, but rather whether the wool will be 10, 20 or 30% stronger than corresponding chrome dyed wool. Furthermore, we have produced yarn which showed an elongation 50% better than corresponding chrome runs. It is, therefore, not astonishing that we obtain materials of extraordinary quality which are 10% stronger in the filling and 25% stronger in the warp than material from chrome runs.

It is well known that Helindon dyeings have superior fastness to perspiration, fulling, washing and light. It is, therefore, not difficult to find manifold uses for these vat colors, including suitings, blankets, carpets that have to stand an oriental finish, and shrink-resistant hosiery.

The statement is made frequently that chlorinated wool cannot be dyed with vat colors. The only reply we have to make is that it seems just as easy to dye chlorinated wool with Helindons as normal wool. As a matter of fact chlorinated wool dyed with Helindons produces yarn of better tensile strength and higher elongation than identical yarn dyed with chrome colors.

In a particular case the Helindon-dyed yarn showed the tensile strength and elongation to be at least 15% better.

An important question which arises frequently is the relative light fastness of indigoids and anthraquinones on wool. Although on cotton most anthraquinones are faster to light than the indigoids, this generalization is not true for wool. Reports that the anthraquinones are faster on wool are based mostly on Fade-Ometer exposures. We find it necessary, therefore, to prove that the Fade-Ometer is not always reliable for exposure of vat dyeings on wool, as was shown on another occasion *(16)*.

From many examples of the unreliability of the Fade-Ometer we shall choose a timely one familiar to most of you, namely the pearl component of the Air Corps shade No. 84. This shade was dyed with the following combinations:

TABLE II

	Sunlight 120 hours	*Fade-Ometer 80 hours*	*Ratio of Fade-Ometer to Sunlight fading*
1 Algosol	0.13	0.73	5.6
2 Helindon	0.20	0.82	4.1
3. Helindon	0.30	1.18	3.94
4 Anthraquinone	0.39	0.61	1.58
5 Algosol	0.53	1.42	2.68
6 Chrome	0.56	0.94	1.68
Light Standards			
4	1.05	1.11	
5	0.77	0.79	
6	0.46	0.45	
7	0.36	0.30	

(1) 1 % Algosol Grey IBL

(2) 1.50% Helindon Grey BLD Powder
0.19% Helindon Brown RRD Powder

(3) 0.82% Helindon Blue BD Powder
0.18% Helindon Brilliant Blue 4B Powder
0.36% Helindon Red BBD Powder
0.38% Helindon Brown RRD Powder

(4) 1.5 % Ponsol Direct Black 3G Double Paste
1 % Indanthrene Violet FFBNA Paste
1 % Indanthrene Blue GCDF Double Paste

(5) 0.48% Algosol Blue O6B
0.16% Algosol Blue O4B
0.36% Algosol Brown IBR
0.18% Algosol Red IFRB

(6) 0.38% Alizarine Fast Grey BBLW
0.12% Anthraquinone Violet D dyed chromate

The above are listed in the order of the best fastness to light as determined by actual sunlight, No. 1 being the best.

However, when we investigate the same dyeings exposed in the Fade-Ometer we obtain an entirely different picture. The anthraquinone dyeing which rated only fourth place in the sun, takes first place in the Fade-Ometer while Helindon dyeing No. 3, which showed very little fading in the sun, was completely destroyed in the Fade-Ometer. While there was little difference between the sun and Fade-Ometer for the chrome dyeing, this difference was remarkable in the case of the Algosols. The Fade-Ometer used by us was in perfect working condition.

A.A.T.C.C. Light Standards 4, ,5 6, and 7 were exposed simultaneously with the above dyeings, and they showed 120 hours actual sunlight to be equal to 80 hours in the Fade-Ometer.

Our visual observations were checked by the spectrophotometer with the Tristimulus Integrator attachment. The magnitudes of fading were calculated from the Tristimulus Integrator values, and were expressed in "Fading Units" comprising the composite color change in all three attributes of the original color.

Table II lists the "Fading Units" in sunlight and Fade-Ometer and the ratio of Fade-Ometer to sunlight fading.

The figures show that the ratio of the Fade-Ometer to sunlight fading is very high in the case of the Helindons and Algosols. The Fade-Ometer fading of Helindon dyeing No. 2 is four times as great as the sunlight fading for the same relative time of exposure. While this dyeing is decidedly faster than Standard No. 7 in sunlight, it would rate below 5 in the Fade-Ometer. A similar relationship is shown with Helindon dyeing No. 3. This dyeing also fades almost four itmes as much in the Fade-Ometer, while the fading of the anthraquinone and chrome dyeing is only 1.5 times greater.

These figures illustrate that results with the Fade-Ometer are entirely misleading and might not correspond at all with the actual fastness to light, at least as far as vat colors on wool are concerned.

Therefore, we must state again that the Fade-Ometer should not be used for measuring the fastness to light of vat colors of wool. Since the proof has been brought therewith we feel that it is no longer feasible to disregard this fact.

Acknowledgment

We wish to express our appreciation to Julius Forstmann & Co., Passaic, N. J., for comparative mill results; I. H. Godlove of General Aniline & Film Corp., Easton, for the calculations based on spectrophotometric readings, F. A. Hamm for the photomicrographs and C. Z. Draves of General Dyestuff Corp. for valuable suggestions. We are especially indebted to Dr. P. Naviasky of General Aniline and Film Corp. for helping us to expand the Helindon line.

References

1. G. T. Hug, A.D.R. Vol. 37, p. 365.
2. S. J. Luscian, Calco Technical Bulletin No. 797.
3. A. Schaeffer, Beitraege zur Theorie der Kuepenfaerbung. Diss. Stuttgart (1926).
4. R. Pummerer and K. Brass, Ber. 44 (1911), 1651.
5. R. Auerbach, Koll. Zeitschr. 35 (1924) 202.
6. R. O. Herzog and A. Polotzky, Ztschr, phys. Chemie 87 (1914), 449.
7. A. Einstein, Ann. d. Physik, 17 (1905), 549, 19 (1906), 371.
8. A. Schaeffer, Zeitschr. Angew, Chem. 46, 618, 1933.
9. E. Valko, J. A. C. S. 1941, 63, 1433.

10. Vasiliev and Deshalyt, Jour. Physic. Chem., Moscow 12, 477-78, 1938.
11. O. Leupin and B. Hartmark, Mell. Textilber. 24, 394-9 (1943)
12. A. Schaeffer, Handbuch der Faerberei, II, 207, 1949.
13. A. Schaeffer, Klepzigs Textil-Ztschr. 44, 1385, (1941).
14. J. W. McBain and T. H. Liu, Journal of Am. Chem. Society 53, 59-74 (1930).
15. Fuerth and Ullman, 15, Kolloid-Z. 41, 304 (1927).
16. H Luttringhaus, A.D.R. Feb. 21, 1949.

Discussion

Question: I would like to ask you what you have done with the Helindons on dyeing unions, on blends of spun nylon and wool?

Dr. Luttringhaus: I cannot report on that as yet.

Question: I would like to ask about the use of peptizing agents. Have you found them to reduce the particle size of varying vat dyestuffs?

Dr. Luttringhaus: No, they do not reduce the particle size of the leuco compound in solution.

Question: Can a vat dye finely dispersed in pigment form be more easily applied to wool than the same undispersed type?

Dr. Luttringhaus: No. If you take an anthraquinone type and disperse the pigment very finely—which has been done in many instances—you will find that these finely dispersed pigments after they have been reduced to the leuco compound do not dye wool with lower amounts of alkali. You need the same high amount of alkali.

Question: When you oxidize with 1 per cent of acid, have you experimented with with the use of an acid fluoride?

Dr. Luttringhaus: No, I have not tried that.

Question: Could the dyestuffs be used in the continued form, either in the pigment or otherwise, or is there a possibility that you could run these things in the top dyeing form, put it through a squeeze roll and oxidize the amount of dyestuff which is left on the fiber?

Dr. Luttringhaus: You would have to have the dyestuff in reduced form.

Question: In other words, you could not do it in pigment form?

Dr. Luttringhaus: If you had the dye in pigment form you would have to use too much alkali for the wool.

Question: Is this process applicable to all types of machinery, or is it best supplied to the type of machinery where the wool is kept submerged?

Dr. Luttringhaus: I have never seen a piece dyed over the reel which was level. If you want to dye vat colors over the reel I would suggest you use the leuco-esters.

Question: How do the level dyeing properties of the Helindons compare with acid colors or metallized acid colors?

Dr. Luttringhaus: The level dyeing of the Helindons is very good and can be regulated very easily with the temperature. There are some better than others, but if you know that you have in your combination one which might exhaust faster, you dye at 120 degrees instead of at 130 or 140 degrees.

Question: What degree of light fastness can we expect from these dyes?

Dr. Luttringhaus: The pearl for the Air Corps 84 shade, was distinctly better than light standard 7.

Question: Is it economical to dye Helindons against the chrome? That would be very important.

Dr. Luttringhaus: If you go into heavy shades, I am sure the cost would be rather high. But in the medium and pastel shades they certainly would be comparable, although it would be a little more expensive. But the dyeing time is so much shorter. If you have a top-chrome dyeing running at the boil for four hours, and if you finish the Helindon dyeing in one hour including oxidation, you save a lot of time and steam.

Question: Has any work been done with the Helindons on nylon and silk?

Dr. Luttringhaus: You can dye silk, yes. But as you know, the fastness of vat colors on nylon is generally not so good. That is one of the reasons that we have not even tried them on nylon.

—♦ ♦—

New York Section Meeting Date Changed

THE date of the April meeting of the New York Section has been changed from the 7th to the 14th. It will be held at Kohler's Swiss Chalet, Rochelle Park, New Jersey.

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association. Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

49-37

Education: University B.S., with subsequent courses in chemistry, sales & textiles.
Experience: Bleachery superintendent; sales manager; commanding officer, U. S. N.
Age 39; married; references; location not restricted.
12-26, 1-9

49-38

Education: B.S., Lowell Textile Institute; expecting M.S. from University of N. H. in January, organic chemistry.
Experience: Five summers, dyeing, bleaching, resin finishing.
Age 25; single, references; position in a finishing dept., northeast U. S., preferred.
12-26, 1-9

49-39

Education: graduating from Philadelphia Textile Institute in February.
Experience: four summers as plant apprentice and laboratory asst., bleachery and dye works.
Age 21; single; references.
12-26, 1-9

49-40

Education: A.B., chemistry, Cornell; finishing course at Philadelphia Textile Institute.
Experience: two summers, asst. in dyehouse and laboratory.
Age 25; married; references, South preferred.
12-26, 1-9

49-41

Education: Expect graduation from Philadelphia Textile School, chemistry & dyeing, 1950; evening school diploma in accounting.
Experience: two years accountant and laboratory ass't; three summers laboratory ass't. and dyehouse apprentice.
Age 31; single; references.
12-26, 1-9

49-42

Education: Expect B.S. from Philadelphia Textile Institute, 1950.
Experience: two summers, kettle hand and laboratory ass't.
Age 23; single; references; tech. sales, east coast, preferred.
12-26, 1-9

49-43

Education: Expect B.S. from Philadelphia Textile Institute, 1950.
Experience: four years chemistry and dyeing; two summers in dye laboratory.
Age 36; married; references; no restriction on location.
12-26, 1-9

49-44

Education: expect B.S. from Philadelphia Textile Institute, 1950.
Experience: 1½ years in various parts of woolen and worsted mills, including dyeing and finishing.
Age 25; single; references; location not restricted.
12-26, 1-9

49-45

Education: B.S. in textile chemistry and dyeing from textile institute, 1949, with year of university training in engineering during war.
Experience: five months in dyestuff application laboratory.
Age 24; single; references; dyehouse or mill laboratory in New England preferred.
12-26, 1-9

Auxiliaries and Testing Group—

MODIFICATION OF FIBER AND FABRIC PROPERTIES BY WRINKLEPROOFING AND STABILIZING AGENTS*

D. D. GAGLIARDI and A. C. NUESSLE

Research Laboratories, Rohm and Haas Co., Phila., Pa.

Introduction

THE range of usefulness of fabrics made of natural and regenerated cellulose fibers can be greatly extended by treatment with various chemicals which improve their resistance to shrinking and wrinkling. Of the many compounds which have been suggested for producing dimensional stability and wrinkle resistance, only a few have received wide acceptance by the textile industry. These are members of the urea-formaldehyde and melamine-formaldehyde series of resins. The simplest compound repeatedly considered for this type of cellulose modification is free formaldehyde. Since the original work of Eschalier *(1)* in 1906, literally hundreds of patents and processes have appeared in literature describing the use of formaldehyde for treating cellulose textile materials. In spite of the great interest in the cellulose-formaldehyde reaction *(2)* no completely satisfactory commercial process has yet been developed for treating cotton and rayon fabrics on a large scale. While in the laboratory, it is relatively simple to treat fabrics with formaldehyde and achieve excellent dimensional stability and wrinkle resistance; in actual plant applications, it is difficult to control the course of the reaction and obtain uniform fiber and fabric modification.

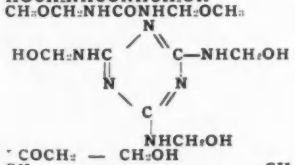
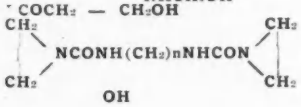
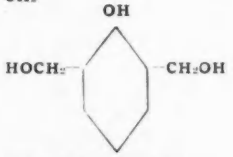
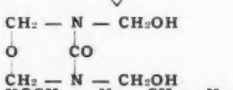
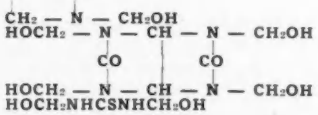
Because of the difficulties encountered with free formaldehyde, a large number of other compounds have been synthesized to produce the same general effect, but with greater ease of application and better uniformity. In Table I are listed a few of the many chemicals which, when applied to cellulose fabrics, produce dimensional stability and wrinkle resistance. This list is by no means complete, since for each compound listed, it is possible to synthesize a variety of derivatives, all of which behave similar to the parent compound. With the exception of glyoxal and the ethylene imine-diisocyanate products, most of the remaining compounds which have been synthesized for this type of cellulose modification consist of formaldehyde condensation products.

Interaction of Compounds with Cellulose

The nature of the action of such wrinkleproofing and stabilizing agents on cellulose has been the subject of considerable controversy, and the problem has not yet been completely resolved. The general argument is centered around the question whether such agents modify cellulose properties by the formation of resin within the amorphous regions of the cellulose or whether actual primary valence crosslinkages are formed between neighboring macromolecules. Unfortunately, too many of the arguments presented either for or against the formation of

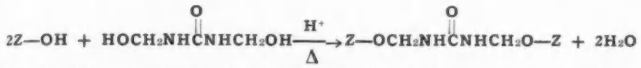
TABLE I

Some Wrinkleproofing and Stabilizing Agents for Cellulose Fabrics

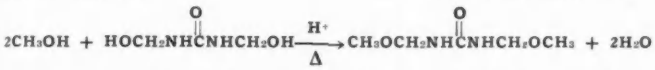
	Product	*Chemical Structure*
1.	Formaldehyde	$HCHO$ or $HOCH_2OH$
2.	Glyoxal	$CHOCHO$ or $(HO)_2CHCH(OH)_2$
3.	Dimethylol Formamide	$HCON(CH_2OH)_2$
4.	Methylol Urea	$NH_2CONHCH_2OH$
5.	Dimethylol Urea	$HOCH_2NHCONHCH_2OH$
6.	Bis(Methoxymethyl) Urea	$CH_3OCH_2NHCONHCH_2OCH_3$
7.	Trimethylol Melamine	
8.	Ketone-Formaldehyde	$COCH_2 - CH_2OH$
9.	Unsymmetrical Ethylene Urea	
10.	Phenol-Formaldehyde	
11.	Dimethylol Uron	
12.	Tetramethylol Acetylene Diurea	
13.	Dimethylol Thiourea	$HOCH_2NHCSNHCH_2OH$

* Presented at the Auxiliaries and Testing Group Meeting, Atlantic City Convention, October 14, 1949.

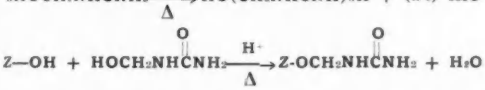
crosslinkages have been based on generalities. For example, in the case of urea-formaldehyde resins it is not possible to make any absolute statement about the mechanism of the reactions involved since there exist large numbers of compounds which contain urea and formaldehyde. Experimental evidence obtained with one compound does not necessarily define the properties of the whole class. Thus, for dimethylol urea crosslinking reactions with cellulose (ZOH) are possible according to the following general scheme:



This reaction is analogous to that observed with simple alcohols reacting with dimethylol urea to give alkoxymethyl derivatives. For example, on reacting two moles of methanol with one mole of dimethylol urea one obtains the compound, bis(methoxymethyl)urea:



For monomethylol urea, no reasonable crosslinking reaction with cellulose can be postulated, and the only possibilities are resin formation or simple cellulose products:

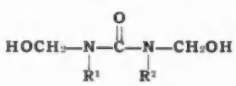


Since most commercial types of urea-formaldehyde products contain mixtures of monomethylol and dimethylol urea, one could argue that both resin formation and cross-linking reactions may occur when cellulose fabrics are treated with such materials.

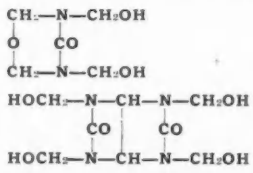
In the case of formaldehyde itself, there is little doubt that the formation of methylene ether bridges between cellulose molecules takes place under acidic conditions *(2)*. Recent work in this laboratory, based on simultaneous weight gain and formal analyses, has shown that there is no one product formed when cellulose is reacted with formaldehyde in the presence of acid catalysts *(3)*. Thus, it was found that while the most common reaction product was $ZOCH_2OCH_2OZ$, simpler methylene bridges and polyoxymethylene linkages also can be formed, depending on the relative concentration of formaldehyde and cellulose.

For all other classes of wrinkle-proofing and stabilizing agents, both resin formation and crosslinking reactions can be postulated *(4)*. In any case, absolute proof of crosslinkages based on chemical evidence is difficult to obtain, and one must rely on physico-chemical data to explain the phenomena observed. Based on the evidence obtained with other high polymers, however, the changes in chemical, physical, and mechanical properties of cellulose resulting from treatment with wrinkleproofing and stabilizing agents can be logically explained by postulating the formation of crosslinkages between cellulose molecules. Such linkages need not necessarily be of the primary valence type but can simply involve strong hydrogen bonding between the cellulose hydroxyl groups and the —NH— bonds in the resin polymer. Either type of linkage results in the formation of bridges between cellulose macromolecules, except that in the first case they are chemical linkages and in the second they are physical.

With the urea-formaldehyde series of compounds, it is possible to synthesize certain structures whose action on cellulose is confined to the formation of primary valence linkages. This can be accomplished by blocking the —NH— groups in the urea which are necessary for resin formation. Such products have the following general structure:



Two actual examples reported in the literature are the following *(11, 12)*:



When such simple substituted urea-formaldehyde compounds are applied to cellulose fibers, crosslinking reactions presumably take place, since these materials do not readily form resins under ordinary conditions of heat and catalysis. The modification of fiber and fabric properties produced by substituted urea-formaldehyde compounds, however, is very similar to that observed with formaldehyde, urea-formaldehyde, melamine-formaldehyde, and other wrinkleproofing and stabilizing agents.

It should be remembered that while the various formaldehyde condensation products may form either (or both) resins and actual primary valence crosslinks in the cellulose, all of such compounds can evolve free formaldehyde during the curing process, which would then form simple methylene bridges.

Modification of Cellulose Properties

In spite of the chemical dissimilarity of various wrinkleproofing and stabilizing agents, there are certain properties which are common to all of them. Thus they all reduce the swelling of cellulose. This is shown in Table II. These data were obtained by treating specimens of an essentially pure regenerated cellulose film with solutions of various compounds containing ammonium salts as catalysts. The impregnated specimens were blotted until the solution content was 100% of their weight. They were then cured for 10 minutes at 150°C. The swelling of these films was measured by a procedure previously described *(3, 5)*. By use of cellulose films, instead of fabrics, the amount of water taken up by the specimens is all water of imbibition since no capillary water can be present.

It is noted in Table II that on a concentration basis, formaldehyde and glyoxal produce the greatest reduction in swelling. On a molar basis, however, the difference between the aldehydes and the resin materials is not as great. Table II also contains data showing the reduction in shrinkage produced by the same compounds. These data were obtained by padding a spun viscose rayon challis with solutions of the various products, framing the samples to their original dimensions, and curing at 150°C. for 10 minutes. The shrinkage values were measured after giving the treated samples a standard rayon wash. In general, there is good correlation between decreased swelling and fa ric shrinkage, the amount of shrinkage being directly proportional to the swelling value. This relation is shown in Figure 1.

Other physical properties of cellulose which are modified by wrinkleproofing and stabilizing agents are solubility and dyeing properties. On treatment with any of the compounds listed in Table II, the cellulose becomes insoluble in such solvents as cuprammonium hydroxide and quaternary ammonium hydroxide. The degree of insolubility produced depends on the number of crosslinkages which have been formed, and it ranges from partial swelling of the fibers to complete insolubility in the cellulose solvent.

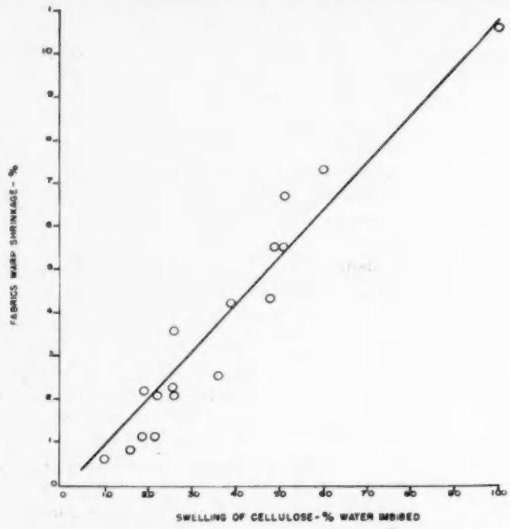


Fig. 1—Relation Between Reduced Swelling of Cellulose and Stabilization of Fabrics Against Shrinkage.

One general effect of crosslinking reagents on dyeing properties is the producing of immunization against direct dyes. This effect is especially pronounced in formaldehyde and glyoxal treated fabrics. In the case of urea-formaldehyde resins and other amine type products, the cellulose not only becomes resistant to direct dyeing, but at the same time takes on affinity for acid wool dyes. The immunizing property of most wrinkleproofing and stabilizing agents can presumably be attributed to the presence of crosslinkages between the cellulose molecules, which prevent the swelling of fibers and reduce the accessibility of sites required for adsorption of direct dyes. The adsorption of acid dyes, however, appears to be confined to the available basic groups existing in the resin polymer.

Table III contains typical data on the effect of increasing formaldehyde upon dye adsorption by 80 x 80 cotton sheeting. The samples of fabric were treated with formaldehyde solutions containing ammonium chloride as catalyst. After curing for 10 minutes at 150°C., the treated and an untreated sample were dyed with a direct dye, Diphenyl Fast Blue GLN. The rinsed and dried samples were then evaluated for extent of dyeing by use of the Hunter Reflectometer. The untreated and dyed sample dyed a deep blue and had the very low reflectance value of 12%, as compared with the original white cotton sheeting with reflectance of 74%. Those samples treated with increasing amounts of formaldehyde showed decreasing dye adsorption (higher reflectance values). At high formaldehyde concentration, practically no dye was taken up by the fibers and the treated sample remained essentially white.

TABLE II

Reduction in Swelling of Cellulose and Fabric Shrinkage Resistance

Concentration %	*Produce Used*	*Catalyst*	*Swelling %*	*Fabric Warp Shrinkage %*
Control	Control—None	None	100	10.0
3%	Formaldehyde	0.3% NH_4Cl	19	2.2
5%	Formaldehyde	0.3% NH_4Cl	16	0.8
10%	Formaldehyde	0.3% NH_4Cl	10	0.6
3%	Glyoxal	0.3% NH_4Cl	26	2.2
5%	Glyoxal	0.3% NH_4Cl	22	1.1
10%	Glyoxal	0.3% NH_4Cl	10	0.6
5%	Urea-Formaldehyde	0.5% $(NH_4)_2HPO_4$	51	6.7
10%	Urea-Formaldehyde	0.5% $(NH_4)_2HPO_4$	39	4.2
20%	Urea-Formaldehyde	0.5% $(NH_4)_2HPO_4$	26	2.1
5%	Melamine-Formaldehyde	0.5% $(NH_4)_2HPO_4$	49	5.5
10%	Melamine-Formaldehyde	0.5% $(NH_4)_2HPO_4$	26	3.6
20%	Melamine-Formaldehyde	0.5% $(NH_4)_2HPO_4$	22	2.1
5%	Subst. Urea-Formaldehyde	0.3% NH_4Cl	36	2.5
10%	Subst. Urea-Formaldehyde	0.3% NH_4Cl	25	2.2
20%	Subst. Urea-Formaldehyde	0.3% NH_4Cl	19	1.1
5%	Ketone-Formaldehyde	1.0% Na_2CO_3	60	7.3
10%	Ketone-Formaldehyde	1.0% Na_2CO_3	50	5.5
15%	Ketone-Formaldehyde	1.0% Na_2CO_3	48	4.3

TABLE III

Immunization of Cellulose Against Direct Dyes by the Formation of Crosslinkages with Acid Formaldehyde

Treatment on Fabric % CH_2O	*% Reflectance After Dyeing*
0	12
2	35
5	53
7	57
10	65
Untreated and Undyed Control	74

Modification of Mechanical Properties of Fibers and Fabrics

To be effective as a wrinkleproofing agent, a compound must not only have ability to form some type of crosslinkage, but must also be diffusible into the cellulose. In a previous publication *(6)* it was shown that changes in fiber and fabric properties are directly dependent on the diffusibility of the compound. Thus, by dialysis of a partially condensed urea-formaldehyde resin, it was found that the monomeric fraction of the resin (a) was diffusible into cellulose, (b) modified the stress-strain properties of the fibers and (c) produced a high degree of wrinkle resistance in the fabric. The more highly condensed fractions, however (a) were not diffusible, (b) did not modify fiber properties, (c) did not produce wrinkle resistance, and (d) simply stiffened the fabric by depositing surface resins on the fibers.

The modification of fiber properties by wrinkleproofing and stabilizing compounds which are diffusible in cellulose is shown by data in Table IV and Figures 2 and 3. These data were obtained by treating a 150/40 filament viscose rayon yarn with various compounds in the presence of appropriate catalysts. The specimens were cured for 10 minutes at 150°C. and tested on a Scott IP-2 machine. The stress-strain diagrams reflect directly the fiber properties. It is noted that the main changes produced in the stress-strain properties of the fibers are (1) increase in modulus, i.e. lowering of fiber extensibility and (2) increase in fiber ability to recover from tensile deformations. It has been indicated *(4, 6)*, previously that increase in elastic recovery and increase in fiber stiffness are the two main properties which determine increase in wrinkle resistance of fabrics. It should be noted that tensile strength of the individual fibers is generally not reduced by wrinkleproofing and stabilizing agents, and in most cases is actually increased. For compounds whose action on cellulose is difficult to control in normal practice, fiber

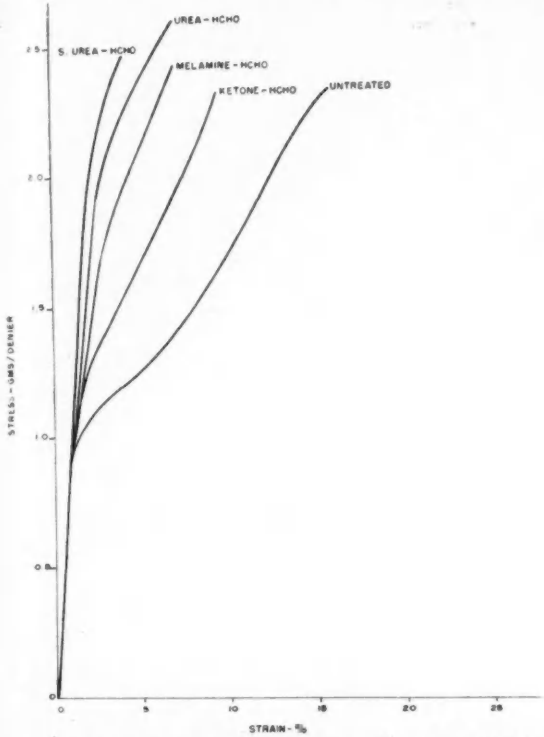


Fig. 2—Modification of Fiber Properties by Some Wrinkleproofing and Stabilizing Compounds—150/40 Viscose Yarn.

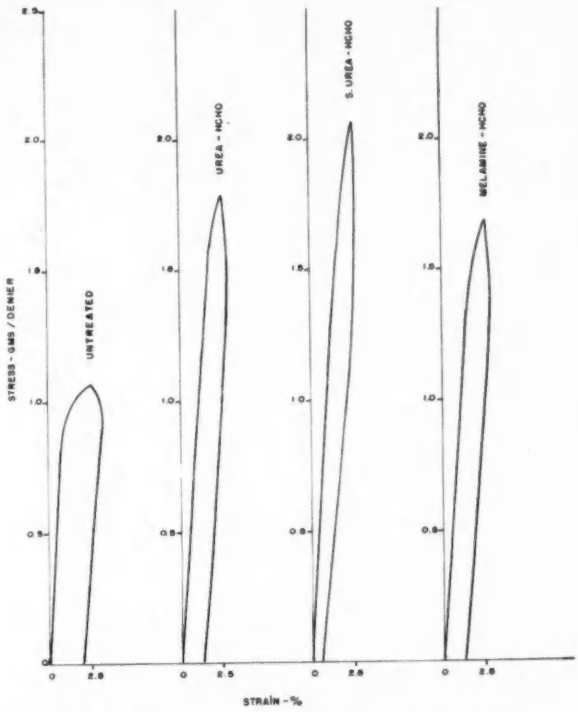


Fig. 3—Increase in Fiber Elastic Recovery by Modification with Some Wrinkleproofing and Stabilizing Compounds.

strength may be decreased. This is true for volatile materials like formaldehyde and glyoxal which tend to produce very non-uniform fiber modification.

Increase in Modulus and Fabric Properties

Correlation of changes in fiber properties with changes in mechanical properties of modified cellulose fabrics has not heretofore received much attention. As a result there exists considerable misunderstanding in the industry about effects of wrinkleproofing and stabilizing agents on fabric properties. One common belief is that the acid catalysts and the high temperatures used to react such agents in the fabric degrade the cellulose. The basis for this belief is in the tear strength and abrasion resistance tests of modified fabrics which are found lower than those of the untreated materials. That such changes in normal treatments have little to do with cellulose degradation, either hydrolytic or oxidative, can be demonstrated by numerous experiments.

First, it will be recalled that when wrinkleproofing and stabilizing compounds are applied to single fibers and cured in the presence of acid catalysts and heat, there is no reduction in tensile strength. What is greatly changed, however, is the modulus of elasticity. The fibers have become stiffer. Figure 4 shows two typical stress-strain curves: one for untreated yarn and the other for a chemically modified viscose filament yarn. Since the area under the stress-strain curve is a measure of the work required to rupture the fibers, it is obvious that while the tensile strength was not reduced by the treatment, the reduction in extensibility has produced fibers with lower capacity for energy absorption. Thus, for the two materials the respective work factors are given by:

$$W_u = \int_0^a PdE$$

$$W_m = \int_0^b P'dE'$$

and $W_u > W_m$

Instead of these integrals it is much more convenient in practice to use the term, "toughness index," suggested by Harold DeWitt Smith *(7)*. Thus for the original and the modified fibers we have the two toughness indices:

$$W_u = \frac{P_a \times E_a}{2}$$

$$W_m = \frac{P_b \times E_b}{2}$$

TABLE IV

Typical Modification of Fiber Properties Produced by Wrinkleproofing and Stabilizing Agents

Compound Applied (10%)	*Tensile Strength Gms./Denier*	*Elongation At Break %*	*Load at 2.5% El.-Gms./Denier*	*Elastic Recovery From 2.5% Exten. %*
Control—none	2.28	16.8	1.05	18
Formaldehyde	2.30	2.7	2.07	89
Glyoxal	1.90	3.7	1.68	65
Urea-Formaldehyde	2.64	7.0	1.77	45
Thiourea-Formaldehyde	2.30	3.1	2.00	80
Subst. Urea-Formaldehyde (A)	2.47	5.7	2.27	59
Subst. Urea-Formaldehyde (B)	2.47	4.1	2.08	70
Melamine-Formaldehyde	2.33	6.5	1.97	50
Subst. Melamine-Formaldehyde	2.37	6.7	1.67	47
Acetylene Diurea-Formaldehyde	2.19	7.8	1.21	42
Subst. Thiourea-Formaldehyde	2.77	5.0	2.12	80
Ketone-Formaldehyde	2.27	9.8	1.29	29

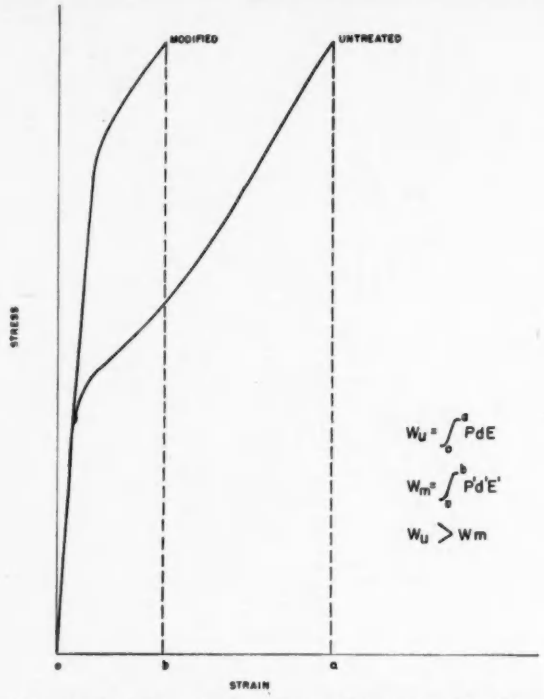


Fig. 4—Reduction in the Energy Absorption Capacity of Fibers as a Result of the Decrease in Extensibility.

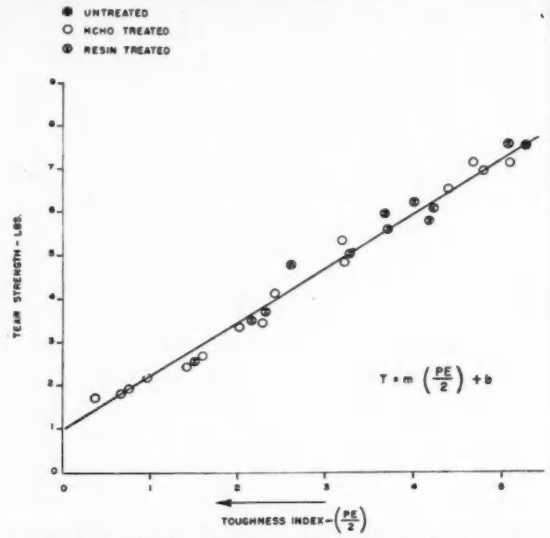


Fig. 5—Reduction in Fabric Tear Strength as a Result of the Decrease in Fiber Extensibility or Fabric Toughness.

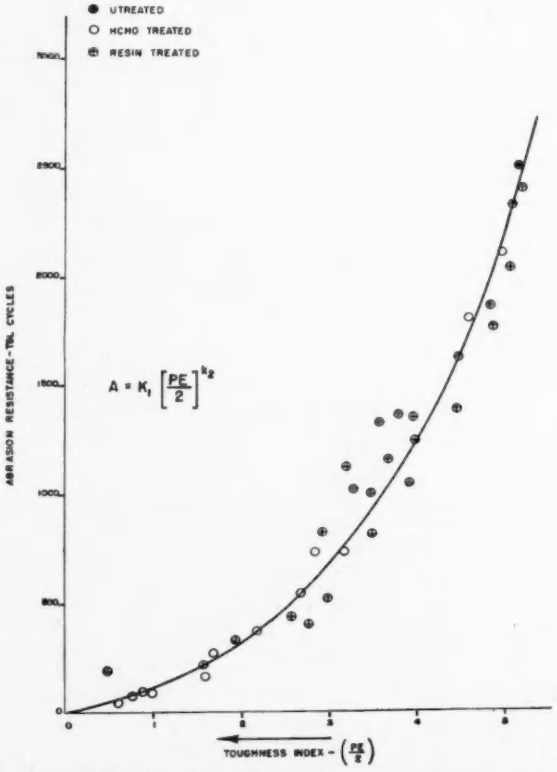


Fig. 6—Reduction in Abrasion Resistance as a Result of the Decrease in Fiber Extensibility and Fabric Toughness

Since such properties as tear strength and abrasion resistance directly reflect the capacity of fibers to absorb energy *(8, 9)*, it follows from general considerations that such properties should be changed by crosslinking reagents, and that reductions in tear and abrasion values result from reduced fiber extensibility rather than cellulose degradation.

The relation between increase in elastic modulus of fibers and reduction in tear and abrasion resistance of fabrics was well established by measuring the mechanical properties of samples of a viscose rayon fabric which had been treated with a number of different types of wrinkleproofing and stabilizing agents. All of these reduced fiber extensibility without significantly affecting fiber tensile strength. The properties examined were tensile strength of fabric, elongation at break, tear strength, and resistance to abrasive action at high stress application as measured by the Tootal, Broadhurst, Lee Abrasion Machine. Correlation was made between toughness of fabric (tensile strength x extensibility ÷ 2) and tear and abrasion resistance. Fabric toughness is directly related to fiber toughness. Since tensile strength of fabric was not greatly changed by the various resin treatments, reduction in toughness index was due directly to decrease in extensibility.

Figure 5 shows tear strength as a function of toughness index of fabric. The original untreated sample of rayon had a tear strength of 7.5 lbs., and a toughness index of 5.3. Following treatment with the various wrinkleproofing and stabilizing agents, tear strength decreased as fiber extensibility decreased. For the

TABLE V

Restoration of Original Fabric Properties by Hydrolysis of Reaction Product in the Fibers

	Before HCl Extraction				*After HCl Extraction*			
Treatment (a)	*Wrinkle Resistance % Recovery*	*Tensile Strength lbs./in.*	*Tear Strength lbs.*	*Abrasion Resistance TBL Cycles*	*Wrinkle Resistance % Recovery*	*Tensile Strength lbs./in.*	*Tear Strength lbs.*	*Abrasion Resistance TBL Cycles*
Control—None	44	52	7.1	2800	55	50	8.0	2600
10% Urea-Formaldehyde	72	56	4.9	780	52	48	7.2	3100
10% U.F. Derivative	85	53	3.3	490	53	52	7.5	2220
10% Melamine-Formaldehyde	71	51	4.6	720	49	50	6.9	2310
10% Glyoxal	90	26	1.7	50	92	31	2.2	70
10% Formaldehyde	90	19	1.7	50	86	26	2.4	50

(a) 0.5% NH_4Cl used as Catalyst.

particular fabric used, the relation between tear strength and toughness is expressed by a straight line, described by the empirical equation:

$$T = m\frac{PE}{2} + b$$

where T = Tear strength — Trapezoid—in lbs.
P = Tensile strength — 1" raveled strip—lbs./in.
E = Extensibility at break — %
m = Slope of the straight line
b = A constant for the fabric

Figure 6 shows abrasion resistance as a function of toughness. Here it is noted that a log relation exists between the two properties, indicating that abrasion resistance is much more sensitive to changes in fiber extensibility than tear strength. The actual relation is described by the empirical equation:

$$A = k_1\left[\frac{PE}{2}\right]^{k_2}$$

where A = Abrasion resistance — TBL cycles to destruction
P = Breaking strength —1" raveled specimen—Lbs./in.
E = Extensibility at break —%
k_1 & k_2 = constants for the fabric and the machine used

From these results we reasonably conclude that what was considered cellulose degradation by wrinkleproofing and stabilizing agents is merely reduced fiber extensibility.

A second proof that the cellulose is not hydrolyzed or oxidized by treatment with wrinkleproofing and stabilizing agents may be found in reversing the reaction which took place in curing the fabric with such compounds. Table V describes the effects produced by a variety of compounds on a number of fabric properties. After these samples were cured for 10 minutes at 150°C., half of each was given an extraction with 0.1N HCl to hydrolize the reaction product. The fabric was again a spun viscose rayon challis. The data in Table V clearly reveal that on hydrolysis of the reaction product, the original properties of the fabric are restored. This would be impossible if any oxidation or hydrolysis of the cellulose had occurred, since those reactions are irreversible in which cellulose is truly degraded. With formaldehyde and glyoxal treated samples, however, simple acid hydrolysis does not restore the original properties of the fabric, since the reaction products formed with these aldehydes are much more stable to hydrolysis and can be removed only by destructive distillation.

A third experiment demonstrated that acid catalysts in normal treatments have little to do with changes in fabric strength. This involved use of a variety of neutral, alkaline, and acid catalysts for condensing a urea-formaldehyde resin. For this test, a spun viscose rayon challis was treated with solutions of a commercially available urea-formaldehyde compound containing 20% resin solids. Each solution contained a different catalyst. The effect of these treatments on fabric properties is shown in Table VI. These data indicate that, regardless of the nature of catalyst used, changes in all fabric properties are determined simply by the amount of resin fixed within the fibers. Thus, mild catalysts produce less reduction of tear and abrasion resistance, but also produce less improvement in shrinkage control and wrinkle resistance than stronger catalysts simply because less resin is fixed within the fibers of the fabric. This relation between degree of modification and extent of reaction of applied product was demonstrated by another experiment in which the amount of applied resin was kept constant though increasing amounts of acid catalysts were used to give solutions of varying pH. The changes in fabric properties produced by these combinations of treatments are shown in Table VII. Again it is seen that the reduction in tear strength and abrasion resistance is directly related to improvement produced in dimensional stability and wrinkle resistance. Such changes are all proportional to the amount of catalyst used and, therefore, to the extent of reaction of the compound in the cellulose, not to any acid damage.

Finally, in regard to the argument that high temperature also may be responsible for this apparent tendering of cellulose, another experiment was performed in which amounts of resin and catalyst were kept constant, but fabrics were cured at

TABLE VI

Relation Between Fixed Resins in the Fabric and Mechanical Properties (a)

Treating Solution (b)	*Catalyst 1%*	*Conversion of Product to Fixed Resins %*	*Fixed Resin Content %*	*Shrinkage % Warp*	*Wrinkle Resistance % Recovery*	*Tensile Strength lbs./in.*	*Tear Str. lbs.*	*Abrasion Resistance TBL Cycles*
Control—None	None	None	None	10.5	40	42	7.4	2200
20% U.F.	None	12	2.5	6.6	55	56	6.3	2000
20% U.F.	NaCl	25	5.6	7.2	59	51	5.8	1820
20% U.F.	Na_3PO_4	38	8.3	4.7	65	49	4.8	1270
20% U.F.	Na_2CO_3	51	11.2	3.8	71	46	3.7	600
20% U.F.	$(NH_4)_2HPO_4$	69	15.7	3.1	71	51	3.9	620
20% U.F.	Cat. D (c)	75	16.4	3.0	69	52	3.9	550
20% U.F.	NH_4NO_3	78	17.2	2.1	75	49	3.7	400

(a) Spun Viscose Rayon Challis
(b) Wet Pickup about 105 to 115%
(c) Catalyst D is a Buffered Ammonium Salt Catalyst (Rohm & Haas Company).

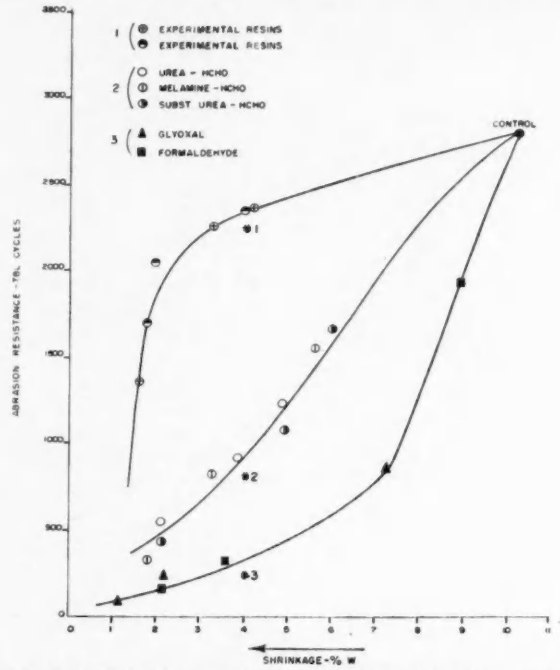


Fig. 7—Relation Between Stabilization Against Shrinkage and Change in Abrasion Resistance (High Stress Application).

temperatures varying from 100°C. to 165°C. The results are shown in Table VIII. These reveal that regardless of the temperature, reduction in tear and abrasion resistance always occurs in conjunction with dimensional stability and wrinkle resistance.

From these data and others not herein presented, we conclude that apparent damage to cellulose as exemplified by changes in abrasion resistance, tear strength, tensile strength (in some cases) is not due to any real hydrolysis or oxidation, but is merely a manifestation of decrease in fiber extensibility. Thus, increasing the elastic modulus by treatment with cross-linking reagents produces fibers which have lower capacity for energy absorption and yarns and fabrics which have reduced capacity for distribution of those stresses applied by tearing, ripping and high abrasive forces.

TABLE VII
Influence of Increasing Amounts of Catalyst on Mechanical Properties (a)

Treatment	*Solution pH*	*Shrinkage (b) % (W)*	*Wrinkle Res. % Recovery*	*Tensile Str. lbs./in.*	*Tear Str. lbs.*	*Abrasion Resistance TBL Cycles*
Control—None	None	11.7	42	50	9.7	3210
8% U.F. Deriv.	7.0	8.9	48	53	9.5	2560
8% U.F. Deriv.	6.0	6.1	67	51	8.0	1040
8% U.F. Deriv.	5.0	3.6	73	52	7.9	1070
8% U.F. Deriv.	4.0	3.3	79	53	7.5	740
8% U.F. Deriv.	3.0	2.8	77	52	7.6	780
8% U.F. Deriv.	2.0	2.5	78	51	7.8	770

(a) Spun Viscose Rayon Fabric
(b) After One Full Cotton Wash

TABLE VIII
Effect of Curing Temperatures on Fabric Properties (a)
8% Urea-Formaldehyde Derivative Applied (b)

Temperature	*Shrinkage (c) % W*	*Wrinkle Resistance % Recovery*	*Tensile Str. lbs./ in.*	*Tear Str. lbs.*	*Abrasion Resist. TPL Cycles*
Control—Untreated	11.0	49	48	9.8	2500
10 min./100°C.	1.9	83	50	6.8	670
10 min./120°C.	1.9	80	48	7.3	480
10 min./150°C.	1.9	79	48	7.4	440
1 min./165°C.	3.6	78	49	7.5	1000

(a) Spun Viscose Rayon Challis
(b) 0.5% Acid Catalyst
(c) After One Full Cotton Wash

Typical Fabric Modification by Different Compounds

Changes in fabric properties produced by chemically dissimilar wrinkle-proofing and stabilizing agents are generally the same. Regardless of their chemical constitution, all such materials reduce tear and abrasion resistance whenever improvements are obtained in wrinkle resistance and dimensional stability. Typical effects produced by a variety of compounds are shown in Table IX. While all of the compounds examined affect various strength properties, if we examine these changes at some one level of elastic performance, or at the same degree of stabilization, it is found that each compound has produced different reduction of tear and abrasion resistance. Figure 7 shows abrasion resistance as a function of improvement in dimensional stability. Most of the common wrinkle-proofing and stabilizing resins produce the same general reduction in abrasion resistance. Formaldehyde and glyoxal give the highest reduction, probably because of difficulties in obtaining uniform fiber modification with these volatile compounds. The two experimental resins appear to be in an entirely different class, since they produce the least changes in abrasion resistance at any level of dimensional stability. From the general shape of the curves given by wrinkleproofing and stabilizing compounds, it would appear that complete elimination of fabric shrinkage by any of these materials produces excessive reduction in tear and abrasion resistance.

General Comments on Abrasion

As was mentioned earlier in this discussion, the abrasion resistance of the fabrics presented was measured on the Tootal, Broadhurst, Lee Machine. This machine, along with most of the others which have been used for textile testing, abrades a sample to complete destruction in a very short period of time by the application of very high repeated stresses. The mechanical forces operating on the fibers of the fabric, under such conditions of testing, bear only a slight relation to what is normally obtained in actual wear of clothing. In actual wear, small stresses are applied slowly over long periods of time. Moreover, in such cases, strains produced in the fibers have a chance to be relieved, since the stress cycles are far apart. Destroying a fabric by an abrasion machine in two or three minutes can hardly be considered a measure of the wearing quality of that fabric. Thus, the apparently great reduction in abrasion resistance produced by wrinkleproofing and stabilizing agents is greatly exaggerated, since it is abrasion resistance only at very high stress

TABLE IX
Typical Modification of Fabric Properties (a)

Treatment (b)	*Catalyst Used*	*Shrinkage (c) % W*	*Wrinkle Resistance % Recovery*	*Tensile Strength lbs./in.*	*Tear Strength lbs.*	*Abrasion Resistance TBL Cycles*
Control—None	None	10.3	48	47	9.2	2830
5% Urea-Formaldehyde	0.5% NH_4Cl	4.9	62	47	7.8	1240
10% Urea-Formaldehyde	0.5% NH_4Cl	3.9	74	51	6.9	930
15% Urea-Formaldehyde	0.5% NH_4Cl	2.1	81	55	6.2	550
3% U.F. Derivative	0.5% NH_4Cl	6.0	64	49	7.5	1690
5% U.F. Derivative	0.5% NH_4Cl	5.0	69	46	7.0	1060
10% U.F. Derivative	0.5% NH_4Cl	2.1	80	49	6.0	450
5% Melamine-HCHO	0.5% NH_4Cl	5.6	66	49	8.3	1580
10% Melamine-HCHO	0.5% NH_4Cl	3.3	74	54	6.8	810
15% Melamine-HCHO	0.5% NH_4Cl	1.9	79	56	6.5	310
3% Exp. Resin I	0.5% NH_4Cl	3.9	56	44	7.9	2320
5% Exp. Resin I	0.5% NH_4Cl	1.9	58	43	7.5	2020
10% Exp. Resin I	0.5% NH_4Cl	1.8	51	31	4.9	1720
3% Exp. Resin II	0.5% NH_4Cl	4.2	52	55	8.8	2360
5% Exp. Resin II	0.5% NH_4Cl	3.3	59	54	8.5	2280
8% Exp. Resin II	0.5% NH_4Cl	1.7	58	36	3.9	1390
5% Ketone-Aldehyde	0.5% Na_2CO_3	7.3	45	44	6.3	1150
10% Ketone-Aldehyde	0.5% Na_2CO_3	5.5	49	42	5.5	800
15% Ketone-Aldehyde	0.5% Na_2CO_3	4.3	50	39	4.9	620
3% Glyoxal	0.3% $H_2C_2O_4$	7.3	56	40	4.0	850
5% Glyoxal	0.3% $H_2C_2O_4$	2.2	67	41	3.4	290
10% Glyoxal	0.3% $H_2C_2O_4$	1.1	77	41	2.5	80
2% Formaldehyde	0.2% NH_4Cl	8.9	49	49	6.9	1960
5% Formaldehyde	0.2% NH_4Cl	3.6	71	41	3.2	380
10% Formaldehyde	0.2% NH_4Cl	2.2	75	34	1.4	180

(a) Spun Viscose Rayon Challis
(b) All Cured 10 minutes at 150°C.
(c) After One Full Cotton Wash

applications which may never be present in normal use of a garment. While we know from analysis of fiber properties that changes in the intrinsic abrasion properties of a fabric are real, because of reduced fiber extensibility, it is doubtful whether such changes decrease the wearing life of a fabric in actual use.

Very recently, by the use of the more precise Shiefer Abrasion machine *(10)*, which allows for testing at different stress applications, we have observed that the difference between the apparent abrasion resistance of an untreated and a resin treated fabric diminishes as the rate of abrading is decreased. This is shown by the data in Table X. Here it is seen that at high rate of wear (high and fast repeated stress application) considerable difference exists between the apparent abrasion resistance of the two fabrics. This is what has always been observed with ordinary abrasion machines designed for fast testing of a large number of specimens in as short a time as possible. As the rate of wear is decreased, however, the difference between treated and untreated fabric diminishes until at very low stress applications the chemically modified fabric actually has higher abrasion resistance than the original untreated rayon sample. Thus it appears, that at very low stresses reduction in fiber extensibility is no longer a major influence on abrasion. The increase in elastic recovery of fibers becomes more important.

In a forthcoming publication we hope to present a complete analysis of the influence of increased modulus and elastic recovery of fibers (produced by cross-linking reagents) on the intrinsic abrasion resistance properties of a cellulose fabric, and to show more clearly the dependence of these properties on the magnitude of cyclic stresses applied.

Summary

The chemical, physical and mechanical properties of cellulose fibers and fabrics may be altered to various degrees by treatment with a large number of compounds whose action on cellulose appears to involve the formation of either chemical or physical crosslinking of the molecular chains. The formation of such crosslinkages reduces the swelling of the cellulose, changes its dyeing properties, decreases its solubility, reduces creep and fiber extensibility, raises the elastic recovery, produces wrinkle resistance and dimensional stability, increases the wet strength of the fibers, reduces the general toughness of the fibers, and produces fabrics of lower resistance to tear and abrasion at high stress application. The reduction of various strength properties is shown to be caused not by acid or heat degradation of the cellulose, but from the decrease in fiber extensibility. Except for formaldehyde and glyoxal, the reactions which take place on curing most wrinkleproofing and stabilizing agents in cellulose can be reversed by mild acid hydrolysis. Removal of the reaction product from the cellulose generally restores the original properties of fibers and fabrics.

TABLE X
Influence of Rate of Abrasion on the Difference Between a Treated and an Untreated Rayon Fabric (Shiefer Machine)

Dead Load onSpecimen lbs./in.²	*Number of Cycles to Destruction (a)*		*Time for Testing a Single Specimen—Minutes*	
	Untreated	*U.F. Treated*	*Untreated*	*Treated*
50	30	10	0.12	0.04
25	160	30	0.64	0.12
10	1,110	230	4.44	0.92
5	6,540	2,520	26.16	10.08
3	19,000	19,000	77.20	77.20
1.6	94,000	125,000	376.00	500.00

(a) Values are the Average of Five Specimens

Acknowledgments

The authors wish to acknowledge the excellent work done by the Misses Angela and Lillian Lempka in treating and testing the materials discussed in this paper.

References

(1) Eschalier, X., French Patent 374,724 (1906).
(2) Schaeffer, A., "Zellwolle, Kunsteide, Seide," *48*, 1-8 (1943).
(3) Gruntfest, I. J., and Gagliardi, D. D., "Text. Res. Jour.," XVIII—No. 11, 543-650 (1948).
(4) Cameron, W. G., and Morton, T. H., "J. Soc. Dyers and Col". *64* No. 10, 329-366 (1948).
(5) Neale, S. M., "J. Text. Inst"., *20*, 373-400T (1929).
(6) Gruntfest, I. J. and Gagliardi, D. D., "Ind. Eng. Chem"., 41, 760-764 (1949).
(7) Smith, H. DeWitt, ASTM Edgar Marburg Lecture (1944).
(8) Hamburger, W. J., "Text. Res. Jour"., XV, 169-175 (1945).
(9) Hager, O. B., Gagliardi, D. D. and Walker, H. B. "Text. Res. Jour." XVII, 376-381 1947).
(10) Shiefer, H. F., "J. Res. N.B.S.," *39*, 1-10 (1947).
(11) Kadowaki, H., "Bull. Chem. Soc. Japan," *11*, 248 (1936).
(12) Technical Intelligence Reports, O.Q.M.G., Textile Finishing Treatments, (1945).

Cellulosic Group—

BLEACHING OF COTTON — A PROPOSED CONTINUOUS HYPOCHLORITE BLEACHING PROCESS*

L. P. SEYB and J. L. FOSTER

Diamond Alkali Company

Abstract

A process is proposed for bleaching cotton goods by continuous methods utilizing, essentially, caustic soda and sodium hypochlorite solutions. Cotton goods which have been singed are pretreated by impregnating with sodium hypochlorite solution having pH preferably between 8 and 9, and available chlorine concentration between 1 and 4 grams per liter. After squeezing to about 100% solution content the goods are allowed to steep one-half hour. Thorough rinsing is followed by saturation of the goods with a 0.5%-1.0% solution of caustic soda, followed by steaming for 20-30 minutes. This is followed by rinsing, saturation of the goods with a 3-4% solution of caustic soda and steaming for another period of 20-30 minutes. The double caustic saturation—steaming operation for the indicated period of time is preferable to a single caustic saturation and steaming for one hour. The goods are then treated with sodium hypochlorite solution using the same conditions as those described for the pretreating operation. After rinsing and the usual finishing steps a fabric is obtained having better whiteness and tensile strength than that usually obtained in commercial bleacheries by classical hypochlorite bleach methods.

Introduction

IN a publication by Kettering and Kraemer (*1*) it is indicated that there are three general procedures in use today for the commercial bleaching of cotton fabrics: the caustic soda kier boil and hypochlorite bleach; the caustic soda kier boil and peroxide kier bleach; and the continuous processes using hydrogen peroxide or sodium chlorite. Kettering and Kraemer further described eleven mill processes which represent common adaptations or variations of these three general bleaching procedures.

The main object of the present investigation was to develop a rapid cotton bleaching process utilizing essentially caustic soda and sodium hypochlorite, and to suggest ways and means for placing such a process on a continuous basis. When using sodium hypochlorite (or chemic, as it is sometimes called in the textile bleaching industry) it is general commercial practice to singe gray goods, sour with a mineral acid or desize with an enzyme, kier boil 10-14 hours with a dilute caustic soda solution which may contain kier assistants, and treat with dilute chemic followed by the usual antichlor, washing and finishing steps. It was obvious that to develop a rapid bleach process, and particularly a continuous one utilizing caustic soda and chemic, the usual 10-14 hour kier boil operation must be considerably shortened. A major portion of the work was done on this phase of the bleaching procedure.

The proposed process comprises treating singed gray goods with a sodium hypochlorite solution of controlled alkalinity, instead of an acid sour or enzyme desizing agent, followed by steeping. This is followed by saturating the goods with 3% caustic soda and steaming in J-box equipment. If J-box equipment is not available, the fabric can be plaited into a kier and boiled with aqueous caustic soda solution. This step is followed by treatment with sodium hypochlorite solution of controlled alkalinity. When the alkalinity of each of the hypochlorite treating steps is controlled to pH between 8.0 and 9.0 the approximate amount of time required for each is one-half hour. The J-box steaming need be no longer than one hour. If a kier is used, three hours boiling is sufficient. By so operating, a finished fabric is obtained having better whiteness and tensile strength than is usually obtained in commercial bleacheries using classical hypochlorite bleach methods. It is to be understood, of course, that various rinsing and auxiliary steps accompany both general commercial practice and the proposed process.

Two features of the process represent somewhat radical departures from classical methods, but such departures are easily incorporated into equipment found in a commercial bleachery. These are treatment of singed gray goods with sodium hypochlorite *before* the caustic soda treatment, and maintenance of pH of the sodium hypochlorite solutions within the range of 8.0 to 9.0 both *before* and *after* the caustic soda treatment.

The experimental section of the report which follows is separated into three distinct parts: small scale laboratory investigations, large scale laboratory investigation at the Philadelphia Textile Institute by the authors, and commercial scale trials.

Small Scale Laboratory Studies

EXPERIMENTAL. PART A

Materials.—Two types of cotton fabric were used for this investigation. One which will be referred to as bagging material was a loosely woven material 31 inches wide, having 48 warp and 44 filling yarns to the inch and weight of one pound per 5 yards. It contained a large number of motes and other foreign matter. The other fabric was broadcloth 40 inches wide, having 112 warp and 64 filling yarns to the inch and weight of one pound per 3.64 yards.

Analytical Methods.—Breaking strengths were made on a Scott Tester, using the ASTM grab method modified as to the size of the test pieces. At least three and usually five test pieces comprised a set of samples which were tested along the warp only. In the gray state these

* Presented at the Cellulosic Fibers Group Meeting, Atlantic City Convention, October 15, 1949.

test pieces measured 10 inches by 1⅝ inches. Each piece was ravelled on one side, then cut in half to give two sections each about 5 inches by 1⅝ inches. Breaking strength was determined on one set of these sections as such. The other set was subjected to the heat resistance test. All samples tested were kept in an air conditioned room at 70° F. and 65% relative humidity for at least four hours prior to testing.

The heat resistance test (2) is a determination of the breaking strength of one of the above 5 by 1⅝ inch sections after a 1-inch band across the width of the section (about midway between the two ends) has been heated to 400° F. ± 5° F. for 30 seconds. The heated section was conditioned at 70° F. and 65% relative humidity for one hour before determination of its breaking strength. More than 15% variation from the maximum result of the heated and unheated breaks indicates the presence of chemicals which damage the fabric, when pressed or ironed in the usual manner during manufacturing or laundering.

Whiteness was measured on a Hunter multi-purpose reflectometer with a green filter. The values reported herein represent whiteness values of the fabric relative to pure magnesium oxide white, which is arbitrarily assigned a value of 100. The test pieces for whiteness determination measured 12 by 3 inches, and were folded to make a 3 by 3-inch surface for the determination. Eight readings were made from eight different surfaces of the test piece, and at least two test pieces were used from each sample.

Ash determinations were made on oven dried (110° C.) samples weighing approximately 5 grams. A sample was carefully charred in a ceramic dish, then ignited to constant weight. The resulting ash was weighed and reported as per cent of oven dried sample.

Carbon tetrachloride or alcohol soluble materials were determined by extracting an oven dried (110° C.) 5-gram sample for three hours in a Soxhlet extractor. The residue after evaporation of the solvent was dried in a 110° C. oven to constant weight and reported as per cent of oven dried sample.

The Fehling test was made in the usual manner. Reddish-brown discoloration indicated oxycellulose present. Blue color indicated no oxycellulose present.

Procedure.—It was first determined experimentally that cotton fabric, satisfactorily kier boiled by usual commercial practice, could be bleached to excellent whiteness and tensile strength by padding with a sodium hypochlorite solution of pH 8.0-9.0 and available chlorine concentration of 1.0-2.0 grams per liter followed by binning or steeping in a J-box at room temperature for 30 minutes. Knowing these optimum conditions for satisfactory rapid chemic bleaching of caustic-boiled fabric, we turned our attention to the problem of a rapid yet efficient boil-off procedure that would fit into the batch kier boiling scheme, or into a caustic boil-off procedure with continuous steaming, as in J-box equipment.

It was thought that if gray goods were given some kind of pretreatment before a caustic soda scouring, the time for the scouring might be materially shortened. Therefore, laboratory experiments were directed toward the effect of treating gray goods with various materials to make extraneous matter in the gray goods easily removable by a caustic soda scour.

A number of pretreating agents were investigated, including chlorine water and aqueous sodium hypochlorite solutions having different pH values. The procedure in every case was first to wet the goods with an aqueous solution of 0.25 percent wetting agent such as a sodium alkyl sulfate, then to rinse thoroughly and squeeze between wringer rolls. The pretreatment step, which followed immediately, involved padding the fabric thoroughly with the pretreating agent by use of wringer rolls, then allowing it to stand in small covered beakers in the dark for thirty minutes. The pretreatments were so timed that all samples could be rinsed at the same time, then caustic boiled in the same container.

The caustic boil was done in 3 percent aqueous sodium hydroxide, using distilled water, for a period of one hour. The container was a 6-liter Florence flask fitted with a reflux condenser. The caustic soda solution was first heated to 100° F., after which the fabric was placed therein; then the solution was heated to the boil over a period of 30 minutes and allowed to boil for one hour. The ratio weight of solution to weight of fabric was intentionally high, of the order 160 to 1. This was to assure that the concentration of the caustic soda would not change appreciably from one experiment to another. In plant runs this ratio is of the order 3.0-3.4 to 1, which corresponds to that common in commercial practice.

On completion of the boil, the spent caustic soda solution was flushed from the 6-liter Florence flask by running in hot tap water (130-140° F.) until the overflow water was clear. The fabric was then transferred to a 4-liter beaker and washing continued, using water at 20-25° C., with occasional manual squeezing until the wash water was neutral to litmus. This was followed by a 5-minute white sour in 1 per cent aqueous hydrochloric acid and another rinsing. The final bleach was done by first padding the caustic boiled fabric with an aqueous sodium hypochlorite solution having pH of 9.0 and an available chlorine concentration of 2.2 g.p.l., then binning in covered beakers in the dark for thirty minutes after which the fabric was antichlored with bisulfite, washed once more, and finally air dried.

Results and Discussion.—The various test results are summarized in Table I in comparison with those of a sample which had received no pretreatment, and of one which had been subjected to a commercial bleaching operation utilizing no pretreatment, an 8-10 hour caustic boil, and hypochlorite after-bleach at pH about 11.5.

By inspection of the data in Table I, it can be seen that the ultimate whiteness of the fabric pretreated with either chlorine water or sodium hypochlorite is better than in which no pretreatment has been used, and also better than that of similar fabric from a commercial hypochlorite bleach operation. The tensile strengths of the test pieces are of the same order of magnitude in every instance, with no tendering from the hypochlorite pretreatment. The commercially bleached shows a lower carbon tetrachloride solubility than other test pieces. This, no doubt, is caused by the longer caustic boil.

Because of the rapid decomposition of sodium hypochlorite solutions having pH values between 4.5 and 7.0, and because such solutions give off great quantities of chlorine to the atmosphere when fabrics are passed through them at high speeds, it is recommended that pretreatment before the caustic boil-off be done with a sodium hypochlorite solution having pH between 8.0 and 9.0.

TABLE I
Bagging Material Bleaching Data

Pretreatment	Whiteness	Tensile Strength		% by weight		
		Unheated	Heated	Alcohol soluble	CCl_4 soluble	Ash
Gray Goods	60.6	47.2	46.1	2.0	0.96	1.2
Commercial bleach	76.4	50.3	51.6	..	0.22	0.18
None	75.7	48.8	44.3	1.4	0.52	0.13
0.45% Cl water	78.6	54.0	49.0	0.57	0.41	0.19
0.22% NaOCl pH 4.5	79.0	47.8	48.7	0.66	0.44	0.18
0.22% NaOCl pH 7.0	79.2	47.8	47.7	0.68	0.43	...
0.22% NaOCl pH 9.0	78.0	51.7	47.7	0.76	0.49	...

TABLE II

Comparison of Caustic Boiling With Caustic Steaming

Run No.	pH of Pretreating and Bleach Baths	G.p.l. Av. Cl_2 in pretreating and Bleach Baths	Time of pretreatment and Bleaching	Time of boil or Steam	Whiteness	Tensile Strength	
						Unheated	Heated
1	7.0	2.0	30 min.	1 hr.	80.9	83.7	81.2
2	9.0	2.0	30 min.	1 hr.	81.1	85.2	79.7
3	9.0	3.0	30 min.	1 hr.	81.8	83.5	79.5
4	9.0	2.0	30 min.	*1 hr.	82.5	85.3	84.3
5**	7.0	2.0	30 min.	1 hr.	82.9	84.0	76.2
6**	9.0	2.0	30 min.	1 hr.	82.9	91.5	83.8
7**	9.0	3.0	30 min.	1 hr.	82.9	86.0	79.2
Comm. H_2O_2 (Kier bleach)	..	..	.....	....		84.0	76.3	71.5
Comm. NaOCl	..	..	.....	....		82.7	70.0	61.0

* 3-20 minute steaming operations
**Caustic boil runs

EXPERIMENTAL. PART B.

Although all of the data contained in Table I were based on an actual boil of the fabric in a caustic solution, it was determined by experiment that such a boil could be effectively replaced by steaming the caustic saturated goods. These data are contained in Table II.

Procedure.—For the runs of Table II a gray broadcloth was used. It was wet out in solution of a wetting agent, padded with hypochlorite containing 2.0 or 3.0 g.p.l. available chlorine at pH 7.0 or 9.0, and allowed to steep 30 minutes at room temperature. The fabric in runs 1-4 was then saturated with 3% caustic soda and steamed one hour, but in runs 5-7 the goods were boiled in 3% caustic soda for one hour. The caustic treatment was followed by bleaching for 30 minutes with hypochlorite, the pH and concentration of which corresponded to that of the pretreating solution used in the particular run. The goods were washed after each of the above steps as well as antichlored after each of the hypochlorite treatments.

The steam chamber consisted of a 24-inch length of 2.5-inch i. d. glass tubing fastened in a vertical position and fitted with rubber stoppers at top and bottom. The steam, generated in a 6-liter Florence flask, entered the chamber through an inlet tube at the bottom and passed upward through an outlet tube at the top. The goods, after being pretreated as described, were given a loose twist and tied to simulate the rope form used in commercial processes. They were then saturated with 3% caustic soda, and while dripping wet, were suspended from a hook in the top stopper of the steam chamber and allowed to remain for one hour while being steamed. Steam was allowed to run for about ten minutes before the goods entered the chamber, so that this was hot and filled with an atmosphere of steam.

Results and Discussion.—From the data of Table II it is seen that in all cases the tensile strength was far superior to that of commercially hypochlorite bleached or commercially peroxide bleached material. However, whiteness values of the first three runs (caustic steaming) ranged slightly below that of the commercially hypochlorite bleached goods. This was probably due to the fact that goods removed from the steam chamber were covered with a yellowish, gelatinous film which prevented proper contact of the fabric with steam. To eliminate this undesirable result run 4 was made, wherein the one hour steaming was three 20-minute periods. After each 20-minute steaming the goods were removed from the steam chamber and rinsed to remove any film that had accumulated. After the first two 20-minute periods the goods were resaturated with the caustic solution before being returned to the steam chamber. A much better looking fabric resulted, and after the final hypochlorite bleach whiteness was improved to equal that of commercially hypochlorite bleached goods, or of the test pieces given a caustic boil in runs 5-7.

Realizing that three paddings of goods with 3% caustic soda, each followed by a 20-minute steaming, may be uneconomical both with respect to chemicals and in tying up of equipment, we determined experimentally that two 20-minute steamings would result in satisfactory caustic treatment wherein the concentration of the caustic for the first padding was between 0.5% and 1.0% and for the second padding about 3%.

It is believed that when the more convenient steaming process is substituted for a kier boiling operation a continuous bleaching process can be devised utilizing hypochlorite and caustic soda as the major chemicals.

Large Scale Laboratory Studies

In going to larger scale laboratory operation, we utilized facilities of the Philadelphia Textile Institute. Results of the bleaching work there substantiated the small scale laboratory findings and indicated that cotton goods from the griege state could be bleached to a very satisfactory degree in a series of processing steps using sodium hypochlorite and caustic soda systems. This required but 130 minutes, less time than had been disclosed theretofore. Eight runs were made with goods similar to the broadcloth and the bag goods used in the small scale laboratory runs. The analytical methods used were similar to those already described.

EXPERIMENTAL PART

Equipment.—The major pieces of equipment used for this work were:

a. A stainless steel lined tank 24x12x21 inches for making the caustic and hypochlorite solutions with which the goods were padded.

b. A laboratory size Butterworth padder, which was essentially a pair of power-driven rubber squeeze rolls measuring 12 inches in length and 4 inches in diameter.

c. A Rodney-Hunt washer equipped with a stainless steel basin capable of holding 200 gallons of water. A steam line leading into the basin afforded direct means of heating the water.

d. An open top steam chamber similar in size and shape to the steel tank in "a." A false bottom in this chamber, also of stainless steel, was perforated to allow steam to pass upward through goods supported thereon.

e. A horizontal autoclave of about 25 gallons capacity for steaming operations at 5-6 pounds per square inch pressure.

f. A Fletcher whirlwind extractor for removing a major portion of rinse water before a final drying operation.

g. A Proctor & Schwartz rapid dryer for the final drying operation. When operating at about 220° F., moisture remaining from the extractor was removed from the goods in 10-15 minutes. The dryer was heated by a circulating stream of hot air.

h. A Beckmann pH meter for pH control of the hypochlorite solutions.

Procedure.—In each run 10 yards of full width cloth was used. The general procedure of the complete bleaching process was: pretreat the gray goods with a sodium hypochlorite solution containing wetting agent, steep, rinse free of the hypochlorite including an antichlor treatment, pad in a caustic soda solution, steam the caustic soda treated goods, repeat the caustic soda padding and steaming treatment as often as two more times, rinse, white sour with hydrochloric acid, rinse free of acid, pad in a sodium hypochlorite bleach solution, steep, rinse free of hypochlorite and antichlor, wash and dry.

For all runs the hypochlorite pretreatment and the final hypochlorite bleach were under similar conditions. Wetting agent was used only in the pretreating solution. Gray goods were placed in the stainless steel tank containing the pretreat solution of 0.25 percent wetting agent and sodium hypochlorite having approximately 3.0 g.p.l. available chlorine and pH 9.0. The goods were then drawn out of the tank through the adjacent Butterworth padder, then back into the pretreat solution and again through the padder. From placing of the goods in the steel tank until the final squeeze the time was 3-4 minutes. After the final squeeze the goods retained from 97% to 223% of pretreat solution, based on the weight of the dry fabric.

The pretreated goods were steeped at room temperature for 30 minutes in an enameled pan covered loosely with a piece of cloth after which they were washed free of hypochlorite, antichlored with one per cent sodium bisulfite and rinsed. They were then padded with 2.1-2.9% caustic soda in the same mechanical manner as described for the pretreating solution, and sent to a steaming operation. The only essential variation between the various runs was in the steaming operation.

Table III specifies the conditions of steaming for each run. When the steaming operation was completed, the goods were washed immediately for five minutes in water at 70° C. Then followed another five minutes wash in cold water. Another wash in 40-50 gallons of water containing 400 cc. of 12.5 normal hydrochloric acid served as a white sour. Two more five minute washes rendered the cloth neutral.

The data of Table III show that in most runs the goods were given two or three steamings for various lengths of time. In such cases the goods were given only one hot water wash after ach steaming, sent back through the caustic padder and finally were steamed again. In runs I, II, and VI a third caustic padding followed by steaming was used. Since the wet goods from the washer were bringing additional water to the caustic solution, dilution in the caustic padder was avoided by determining the weight of water on the incoming fabric and adding the calculated amount of flake NaOH to maintain three per cent concentration in the padder tank. The thorough wash with white souring was provided only after the final steaming, just prior to the bleaching step.

Following the steaming the remaining steps in the process were the same in all runs (i.e., padding with a final hypochlorite bleach containing approximately 3.0 g.p.l. available chlorine at pH 9.0, steeping 30 minutes at room temperature, giving four five-minute washes with 40-50 g. of sodium bisulfite in 40-50 gallons of water in number 2 wash, sending the goods through the whirlwind extractor, and finally putting through the rapid drier).

In Table III the percent solution pick-up by fabric is based on dry weight of fabric.

TABLE III
Conditions for Treatment of Fabric

Run No.	Method of NaOH Boil-Off	% Aq. NaOH** 1st Pad	2nd Pad	3rd Pad	G.p.l Av. Cl₂** Pretreat	Bleach
I	three 20 min. steamings	2.2	2.4	2.1	3.02	2.80
II	three 20 min. steamings	2.9	2.8	2.7	2.80	2.96
III	one 60 min. steaming	2.9	..	..	2.90	2.64
IV A	two 30 min. steamings @ 5-6 lbs. pressure	2.9	2.9	..	3.02	2.94
IV B	one 30 min. steaming @ 5-6 lbs. pressure	2.9	..	..	3.02	2.94
V	two 30 min. steamings @ 5-6 lbs. pressure	2.9	2.9	..	2.80	3.25
VI	three 20 min. steamings	2.9	2.9	2.9	3.02	2.93
VII	two 20 min. steamings	2.9	2.9	..	2.80	2.86

* To arrive at a dry weight for determining this value, one-half of the original weight of the 20-yard piece (5 lbs. 5 oz.) was used.

** Adjusted for water on incoming fabric.

Run No.	% Solution Pick-up By Fabric: Pretreat	Aq. NaOH 1st Pad	2nd Pad	3rd Pad	Bleach
I	97	170	178	165	33
II	107	150	130	135	124
III	112	155	...	...	155
IV A	223	153	*150	...	153
IV B	223	153	...	...	153
V	106	153	179	...	137
VI	119	166	178	169	166
VII	154	149	154	...	151

Results and Discussion.—Table IV contains the results of experiments at the Philadelphia Textile Institute. Runs V and VI were made with the bagging material, and runs I, II, III, IV A, IV B and VII with broadcloth. In the runs where a series of alternating caustic paddings and steamings were used, such series is indicated (in Table IV, for example), by the phrase "three 20-minute steamings".

The samples for testing were obtained by dividing each 10-yard run into five 2-yard pieces. From each 2-yard piece five strips, 1⅝ by 12 inches, were cut for tensile strength and two strips, 3 by 12 inches, for whiteness. In this manner of sampling the average for ecah run was represented by 25 breaks for tensile strength and 10 samples for whiteness on each of which 8 readings were made. The thread count of the bleached broadcloth averaged about 116 x 70 from each run, and the bagging material about 46 x 52.

The data of Table IV show that regardless of the method of caustic steaming, every run yielded a fabric of excellent whiteness without oxycellulose formation. Also in no run was there a loss in tensile strength as great as that produced by commercial bleaching. The average value for every run closely checks, within experimental error the value for the pre-shrunk gray goods. In

TABLE IV

Sample No.	Caustic Steaming Method	Whiteness	Tensile Strength: Unheated	Heated	Fehling Test
Gray bagging material 44 x 48		58.2	41.2	39.9	...
Gray bagging material pre-shrunk by 1 hour water boil. 46 x 52		...	50.4	45.7	...
Commercially hypochlorite bleached bagging material	10-12 hrs. kier boil	76.4	51.0	51.6	...
Gray broadcloth 112 x 64		70.0	76.3	71.6	...
Gray broadcloth pre-shrunk by 1 hour water boil 116 x 70		...	80.3	79.0	...
Commercially hypochlorite bleached broadcloth	10-12 hrs. kier boil	82.7	70.0	61.0	...
Commercially peroxide bleached broadcloth	10-12 hrs. kier boil	84.0	76.3	71.5	...
I	three 20 min. steamings	84.2	80.5	76.5	Negative
II	three 20 min. steamings	85.3	80.5	78.3	Negative
III	one 60 min. steaming	83.4	78.3	76.0	Negative
IV A	two 30 min. steamings @ 5-6 lbs. pressure	84.3	79.5	73.5	Negative
IV B	one 30 min. steaming @ 5-6 lbs. pressure	83.6	79.1	75.7	Negative
V	two 30 min. steamings @ 5-6 lbs. pressure	84.6	49.6	46.0	Negative
VI	three 20 min. steamings	85.1	51.3	48.7	Negative
VII	two 20 min. steamings	84.8	81.5	76.8	Negative

TABLE V

Run No.	Whiteness	Tensile Strength	
		Unheated	Heated
X-1	80.9	79.5	75.0
X-2	81.8	80.1	77.4
X-3	81.9	80.6	75.1

those runs where the tensile strength is greater than that of the original goods, experimentation proved this to be the result of shrinkage. Some of the gray goods were boiled for one hour in plain water. When dried, this boiled material showed an average thread count identical with that of the finished fabric, and its tensile strength checked very closely with a value calculated on the basis of increase in thread count over the original gray goods. The negative Fehling tests and high tensile strengths indicate practically no cellulose degradation. It should be noted that the foregoing statements hold true for both the bag material and the broadcloth.

Confining one's attention to Table IV and a comparison of one run with another and considering first the broadcloth runs at atmospheric pressures (i.e.—II, III and VII), it is observed that three 20-minute steamings are a little better than two 20-minute steamings for whiteness. These in turn are a little better than one 60-minute steaming. Note further that the tensile strength of goods given one-hour steaming falls slightly below the other two runs, with the two 20-minute steamings rating first in this respect. These facts would seem to indicate, as the preferred procedure, that the steaming operation be broken into two or three steps. Since in all three runs under discussion the tensile strength exceeds that of commercial H_2O_2 bleached goods, and the whiteness of the latter is also exceeded by both the two 20-minute and three 20-minute steamings, it appears to be reasonable to recommend two 20-minute steamings as sufficient to provide a bleached broadcloth material having superior qualities.

Focusing attention on the runs where pressure was employed (i.e., IV A and IV B) and comparing the properties of either with any or all of the runs employing atmospheric steaming, it is seen that nothing is gained by the use of pressure. In fact, regardless of whether 5-6 pounds pressure is employed for 30 minutes or one hour, quality of goods falls slightly below that obtained by atmospheric pressure steaming under any conditions studied.

Runs V and VI, where gray bagging material was used, prove beyond doubt that this process offers something more than simplicity. Without loss in tensile strength, both these runs show whiteness values far superior to the commercially bleached goods. Here again note that pressure steaming offers no advantage over steaming at atmospheric pressure. A point not indicated in the tables is that the gray bagging material is a high mote-containing fabric, and that the motes are removed by the proposed method.

After this larger scale work at the Philadelphia Textile Institute it was determined that an antichlor after the pretreating step was unnecessary. Passing the hypochlorite pretreated gray goods (after steeping) through a tight strand washer will remove enough of any residual hypochlorite to avoid harming fabric in the immediately following caustic treatment. Using gray broadcloth, three runs were made on a laboratory scale. In each of the runs the gray goods was pretreated with an aqueous solution of sodium hypochlorite of pH 9.0 containing 3.0 g.p.l. available chlorine and a wetting agent, allowed to steep 30 minutes, washed, given three 20-minute caustic steamings, washed, white soured, bleached with an aqueous solution of sodium hypochlorite of pH 9.0 containing 3.0 g.p.l. available chlorine, allowed to steep 30 minutes, washed, antichlored, and dried. Results appear in Table V.

In run X-1 the fabric, after the hypochlorite pretreatment, was washed until a very faint starch iodide test was visible; in run X-2 the fabric was thoroughly washed and antichlored; in run X-3 very little of the pretreatment hypochlorite was removed before subjecting the fabric to caustic steaming. It is readily seen that the whiteness and tensile strength of fabric from each of the runs check quite closely, indicating that an ordinary washing is sufficient between pretreatment and boil-off.

Commercial Scale Plant Trials

For operating the proposed process on a commercial scale it was hoped that a continuous range could be tried, thereby making the caustic soda treatment a steaming operation as in a J-box instead of the kier boil which is usually a batch operation. However, to date the process has been tried in only two commercial bleacheries, neither of which had the familiar J-box equipment for caustic steaming. Instead, caustic kier boiling was used. Although the goods in the commercial runs at the first bleachery were pretreated with hypochlorite for at least the minimum recommended time of thirty minutes, it did not proceed through the operation on a first in, first out basis, but went through the familiar binning techniques. Thus the "last in" fabric was "first out", and the indicated steeping time in discussion of commercial runs at the first bleachery is always with reference to the "last in" fabric. At the second bleachery a J-box was available for binning after the prechemic treatment, but a kier boil was used as at the first bleachery. Even though the equipment was not of the type in which fabric could be processed in the minimum proposed time, nevertheless the data obtained at the bleacheries is believed of sufficient value to merit investigation of the proposed process on a continuous range.

Procedure.—In the first bleachery four runs were made with five different lots of fabric. In all runs the same general processing steps were followed. The fabric was passed through a gas fired singer, then immediately into a quench box which contained about 425 gallons of an aqueous solution of sodium hypochlorite and wetting agent. In all trials wetting agent concentration was 0.05%, while concentration of the hypochlorite varied as shown in Table VI. During passage of fabric through the quench box, concentration of available chlorine therein was controlled by addition of a stock solution of sodium hypochlorite, and pH was controlled by the addition of a 10% aqueous sulfuric acid solution. In each trial fabric coming from the quench box was plaited down in three separate bins, where it was allowed to lie thirty minutes, measured from the time the last yard of that particular portion of the lot passed through the quench box. This was followed by washing in a tight strand washer, padding in a saturator containing aqueous caustic soda, and plaiting into a circulator kier. An aqueous caustic soda solution containing sodium tetrapyrophosphate and kier assistants in the form of a pine oil-sulfonated castor oil mixture were pumped to the kier. The kier, heated directly with steam, was closed after proper venting. A sample of the caustic solution was usually removed from the kier after the first hour of circulation for determination of caustic soda concentration. When 15 pounds per square inch gauge pressure was reached the kier was held at this pressure an additional three hours. The steps after the caustic boil consisted of standard bleachery operations including washing down in the kier, pulling out of the kier, tight strand wash, sour, wash, chemic, wash, sour, wash and can dry.

TABLE VI lists the types of fabric proc-

TABLE VI

Trial No.	Yards Processed	Thread Count per inch: Warp	Thread Count per inch: Filling	Width in inches	Yards per Pound	Speed through singer yds./min.	Hypochlorite Conc. g.p.l.: Stock Solution	Hypochlorite Conc. g.p.l.: Quench Box
IV	18,990	68	72	45	2.45	120	8.0	3.0-3.5
VI	8,797	28	28	52	1.18	127	3.5	1.5-2.0
VII	10,600	60	50	52.5	1.20	122	3.5	1.3-2.0
VIII	6,022 20,412	88 64	40 80	37 46.5	2.35 4.00	150 175	5.3	2.0-3.0

	pH in Quench Box	Caustic Soda Conc.: In Saturator	Caustic Soda Conc.: In Kier	Gallons of 10.5% Hypochlorite used in pre-chemic	Pounds of wetting agent used in pre-chemic	Gallons 10% H_2SO_4 used in pre-chemic
IV	7.9-9.3	1.5%	2.5%	43.3	2.7	13.5
VI	7.7-9.2	2.3%	2.9%	32.8	4.2	12.5
VII	7.6-9.1	1.2%	2.8%	29.0	2.9	6.0
VIII	7.8-8.9	1.3%	2.9%	60.0	5.3	23.8

TABLE VII

	Description of Sample	Tensile Strength (#/in.): Warp	Tensile Strength (#/in.): Filling
1	Gray goods	89.6	84.3
2	After boil, sour and wash but prior to final chemic (sample from top of kier)	81.0	90.0
3	Same as (2) but sample from bottom of kier	84.1	94.9
4	Bleached goods by pre-chemic method	95.5	75.3
5	Bleached goods by regular bleachhouse procedure	95.6	66.2

TABLE VIII

	Description of Sample	Tensile Strength (#/in.): Warp	Tensile Strength (#/in.): Filling
1	Gray goods	110	93.3
2	Bleached goods by pre-chemic method	113	109
3	Bleached goods by pre-chemic method	117	96.4
4	Bleached goods by pre-chemic method	117	97.7
5	Bleached goods by pre-chemic method followed by dyeing	112	70.3
6	Same as (5) except bleached goods was made by regular bleachhouse procedure	110	72.6

TABLE IX

	Description of Sample	Tensile Strength (#/in.): Warp	Tensile Strength (#/in.): Filling
1	Gray Goods	110	112
2	White goods (pre-chemic method)	110	110
3	White goods (regular bleach method)	110	111
4	Sample (2) printed	102	89
5	Sample (3) printed	102	86

TABLE X

	Description of Sample	Tensile Strength (#/in.): Warp	Tensile Strength (#/in.): Filling
1	Twill gray goods	111	45.8
2	Twill white by pre-chemic method	111	53.6
3	Twill white by pre-chemic; dyed chartreuse	99.5	40.1
4	Twill white by pre-chemic; dyed green	89.9	40.3
5	Twill white by pre-chemic; dyed wine	106	38.5
6	Sateen gray goods	27.7	31.3
7	Sateen bleached by pre-chemic method	33.9	39.1
8	Sateen bleached by regular bleach	35.1	41.6
9	Sateen pre-chemic; not finished; dyed tan	32.6	42.0
10	Sateen regular bleach; not finished; dyed tan	32.5	40.5
11	Sateen pre-chemic; finished; dyed tan	33.3	40.2
12	Sateen regular bleach: finished; dyed tan	33.9	40.3

TABLE XI

	Description of Sample	Tensile Strength (#/in.): Warp	Tensile Strength (#/in.): Filling	Whiteness	% Alcohol Soluble	% CCl_4 Soluble	% Ash
1	Gray goods	51.7	49.6	52.4	...	...	...
2	Pre-chemic bleached	49.8	51.0	77.8	0.33	0.12	0.15
3	Bleached by regular procedure	49.7	51.2	76.6	0.28	0.12	0.12

essed in the four trials together with the processing variables for each through the kier boil.

Results and Discussion.—The quantities of chemicals listed in Table VI are those actually consumed and do not include amounts required to fill the quench box since such quantities were present both before and after passing the goods through.

In trial IV, when approximately one-half the yardage had been singed, the quench box solution reached the temperature of 91°F., and remained between 91° and 102°F., throughout the remainder of the run.

Tensile strength data of fabric samples, taken at various steps of the pre-chemic process of trial IV and from a similar fabric processed by the regular bleachhouse procedure, are in Table VII.

Sample 5 (Table VII) represents fabric processed by regular bleachhouse routine. This includes enzyme desizing and a 10-12 hour caustic boil at 15 pounds per square inch steam pressure, using the same concentration of caustic soda as in the pre-chemic method. After the caustic boil, subsequent steps were identical to those used in the pre-chemic method. The bleachhouse operators stated that whiteness of the finished fabric treated by the pre-chemic method was equal, and in many cases superior, to that processed by the regular bleachhouse method. No reflectometer data regarding whiteness are available on these fabrics. Tensile strength of fabric processed by the regular bleachhouse procedure showed practically the same value in the warp as that from the pre-chemic method, but fabric from the pre-chemic method had a noticeably better tensile strength in the filling than fabric processed by the regular procedure. Printing and glazing of white goods from the pre-chemic method were equal in quality to those obtained by regular bleachhouse procedure.

In trial VI the fabric was highly absorbent gray goods. Tensile strength data of fabric samples from various sections of the 8797-yard piece, and a similar lot which had been bleached by the regular bleachhouse procedure, are in Table VIII.

Dyeing of bleached goods from the pre-chemic method was equal in quality to that following regular bleachhouse procedure.

In trial VII the gray goods was cotton sheeting material. Comparative tensile strength data of fabric samples from the pre-chemic method of bleaching in trial VII and the regular bleachhouse method appear in Table IX.

No difficulties were experienced in printing these goods, and as the above data indicates tensile strength of goods treated by the pre-chemic method were equal to those from the same lot processed by the regular bleachhouse method.

In trial VIII two lots of fabric were processed in succession. The first to pass through the quench box solution was a 37-inch wide twill, and the second was a 46½-inch wide sateen. All previous commercial trials had been made with print goods. Trial VIII was made to obtain information on use of the pre-chemic method on fabrics to be plain dyed. When

about one-half of the fabric had been processed, the temperature of the quench box solution was 100°F., but it never went higher.

Tensile strength data of various samples taken from the two lots of trial VIII, both before and after dyeing, appear in Table X.

The twill, vat-dyed by the pigment-pad-jig method, was much softer than any similar construction processed by regular bleachhouse procedure and dyed by similar method. All dyeings were very level and without trace of blotches and resists.

In a second bleachery, the regular bleachhouse procedure was as described for the first bleachery except for a sulfuric acid gray sour in place of enzyme desizing. Only one run was made in this second bleachery. The goods were 30,000 yards of loosely woven bagging material described in the "Small Scale Laboratory Studies" section of this paper. These were very dirty, motey goods, considered by the bleaching personnel to be very difficult to bleach. In fact it had sometimes been necessary to subject such goods to a double kier boil.

For our testing purpose, however, these gray goods were passed through a saturator containing a wetting agent and aqueous sodium hypochlorite. The concentration of available chlorine was maintained between 2.0 g.p.l. and 2.3 g.p.l., but because of a manual arrangement for controlling pH the latter could only be kept in a range between 9.0 and 10.0. After passing through the saturator, the fabric entered a J-box, where it remained forty minutes. It was then rinsed, loaded into a kier and boiled with a 2.65% aqueous caustic soda solution for three hours under 15 p.s.i. gauge pressure. Regular bleachhouse routine was followed thereafter. The hypochlorite bleach after the caustic boil contained 2.35 g.p.l. available chlorine and had pH between 10.7 and 11.0.

After the final rinse and passing over dry cans the goods had a good white appearance and were completely free of motes. Bleachery personnel agreed that they appeared whiter to the eye than a sample of the same goods bleached by regular bleachhouse routine. Test results appear in Table XI.

Summary

An object of the present investigation was to develop a rapid cotton bleaching process utilizing essentially caustic soda and sodium hypochlorite, and to suggest ways for placing such a process on a continuous basis. This we believe has been done.

Three major steps are involved in the order of application:

1. Treatment of gray goods with a sodium hypochlorite solution of controlled pH, concentration and time.
2. Impregnation of the sodium hypochlorite treated gray goods with caustic soda, followed by steaming.
3. Treatment of steamed goods with a sodium hypochlorite solution of controlled pH, concentration and time.

With proper equipment it is believed that the entire process could be performed continuously, requiring no longer than two hours total processing time.

References

(1) Kettering and Kraemer, Commercial Cotton-Bleaching Processes and their Effect on Fabrics. Tech. Bull. 941. U. S. Dept. of Agriculture, April 17, 1947.
(2) Test conducted according to directions received from Cluett, Peabody & Company.

—♦ ♦—

LTI Student Chapter Meetings

THE second meeting of the year of the Lowell Textile Institute Student Chapter was held on November 2, 1949.

Chairman Rebenfeld reported on the Intercollegiate Chemical Society meeting which was held on October 26, 1949, at Harvard. Mr. Rebenfeld, Robert Morrison, and Joan Gregg represented the Student chapter.

The third regular meeting of the year was held on Thursday, December 1, 1949. Chairman Rebenfeld reported on the Intercollegiate Chemical Society meeting which was held at Harvard on November 16.

At the seminar held on December 6, 1949, Robert Robinson of Uxbridge Worsted spoke on "High Temperature Dyeing".

On December 14, a movie entitled "This is Nylon", was shown at the Institute for all students.

Respectfully submitted,
DOROTHY A. McCARRON, *Secretary*.

—♦ ♦—

Report of PTI Student Chapter

THE Philadelphia Textile Institute Student Chapter held its first meeting of the season on November 16, 1949. Carl Sickerott of Bailey Dye Works, Inc., spoke on the processing of nylon hosiery from yarn to finished stocking, with particular attention to dyeing. John H. Hennessey Jr. was elected Chairman, Walter T. Ambrogi, Vice Chairman, and Harry A. Roselle, Secretary. Meetings were planned for Jan. 11, Feb. 1, Mar. 1, Mar. 29, Apr. 26 and May 24.

Respectfully submitted,
HARRY A. ROSELLE, *Secretary*.

WNE Meeting Dates Approved

THE following meeting schedule for the remainder of the 1949-50 season of the Western New England Section has been approved by the officers.

January 27—Rapp's Restaurant, Shelton, Conn.

March 10—at Waterbury, Conn.

April 14—Rapp's Restaurant, Shelton, Conn.

May 26—Waverly Inn, Cheshire, Conn.

June 23—Outing at Wallingford, Conn. Country Club.

—♦ ♦—

Report of WNE Section

THE second 1949 fall meeting of the Western New England Section was held at Rapp's Restaurant, Shelton, Connecticut on Friday, October 28. Fifty-three members and guests heard E. A. Leonard of the Alexander Smith and Sons Carpet Company give an interesting talk on the functions and activities of a textile laboratory.

Respectfully submitted,
ARTHUR S. NYQUIST, *Secretary*.

—♦ ♦—

Philadelphia Section Meeting Dates

THE following dates were approved at a recent Officer's Meeting for meetings of the Philadelphia Section:—

January 13th, 1950 (Kugler's Restaurant).

February 24th, 1950 (Kugler's Restaurant).

March 31st, 1950 (Kugler's Restaurant).

May 5th, 1950 (Kugler's Restaurant).

June 9th, 1950 (Annual Outing).

October 13th, 1950.

December 8th, 1950.

January 19th, 1951.

Meetings listed for Kugler's Restaurant are held in Philadelphia.

—♦ ♦—

Report of Utica Technical Institute Student Chapter

THE Utica Technical Institute Student Chapter held its regular meeting on December 6, 1949, with Chairman Robert Zarnoch presiding.

Rudolph Hoffman, Chief Chemist of the Skenandoa Rayon Corporation spoke on the invention of viscose rayon and the processes involved in manufacturing the fiber.

After the meeting refreshments were served in the school cafeteria.

1950 Annual Meeting of Inter-Society Color Council

ON March 8, 1950, in the Keystone Room, Hotel Statler, New York City, the 19th annual meeting of the Inter-Society Color Council will be held. Members of the Inter-Society Color Council's 19 member bodies are cordially invited to attend.

Committee discussions and the annual business session will be held in the morning. The afternoon session, arranged by representatives of the four design, decoration, and architect member bodies of the Council, will be held under the title "Color As Used In Architecture, Design, and Decoration." Each of the following speakers will present the color viewpoint of practicing members of his association:

Scott Wilson, American Designers' Institute.

Waldron Faulkner, American Institute of Architects.

Karl Bock, American Institute of Decorators.

Egmont Arens, Society of Industrial Designers.

A dinner meeting, "I.S.C.C. Operation Rainbow," is being arranged by a special committee under the chairmanship of Mrs. Helen D. Taylor. In the evening, Ralph M. Evans will present one of his illustrated lectures, "Seeing Light and Color."

For further information address the Inter-Society Color Council, Box 155, Benjamin Franklin Station, Washington 4, D. C.

—◆ ◆—

Details of Piedmont Section Meeting

PLANS are now complete for the Greenville, S. C. Meeting of the Piedmont Section to be held January 21, 1950. Hotel reservations should be made direct with the Poinsett Hotel. Following is the Program:

Technical Session:—3:00 P. M.—Ball Room.

First Paper: "Operating a Piece Goods Dyehouse" by Graham Fisher of E. F. Drew Company, followed by a question and answer period.

Second Paper: "Resin Finishing of Cotton Piece Goods" by Dr. Ralph Nickerson of Monsanto Chemical Company, followed by a question and answer period.

Thomas W. Kitchen of Rodney Hunt Machine Company will preside at the Technical Session.

Banquet—7:00 P. M.—Ball Room.

Speaker: Dr. Nicholas P. Mitchell, eminent writer and news commentator. His subject: "What Can a Man Believe?"

Membership Applications

JUNIOR

Samuel L. Mistretta—Text. Chemist, Buffalo Electro-Chemical Co., Inc., Buffalo, N. Y. Sponsors: F. P. Greenspan, B. K. Easton.

Frank L. Moskal—Dyestuffs Formulator, Hellwig Dyeing Corp., Philadelphia, Pa. Sponsors: A. W. Etchells, A. V. Morrell.

Paul J. Pernice—Chemist, General Dyestuff Corp., New York 14, N. Y. Sponsors: H. E. Hager, J. R. Bonnar.

Cecil R. King—Supt. of Dyeing & Finishing, Saskatchewan Wool Products Corp., Moose Jaw, Sask., Canada. Sponsors: F. G. Thwaites, G. A. Wilkie.

Marvin H. Smith, Jr.—Asst. Chemist, Grace Bleachery, The Springs Cotton Mills, Lancaster, S. C. Student Prize Award.

ASSOCIATE

Edna W. Buster—Assoc. Prof. of Clothing & Textiles, Texas Technological College, Lubbock, Texas.

Walter C. Carter—Asst. Prof. of Text. Engr., Georgia Institute of Technology, Atlanta, Ga.

George H. Cook—Research & Develop., United Piece Dye Works, Lodi, N. J. Sponsor: R. Eck, C. A. Heydon.

Arthur W. DeRevere—Mechanical Engr., J. O. Ross Engr. Corp., New York, N. Y.

Frank Diedrich—Production Mgr., Powdrell & Alexander, Inc., Danielson, Conn.

Shirley Goodman—Public Relations Assoc., Fashion Inst. of Technology, N. Y., N. Y.

Eugene J. Grady—Salesman, Jacques Wolf & Co., Passaic, N. J.

Thomas M. Jackson, Jr.—Sales Engr., Fletcher Works, Inc., Philadelphia, Pa.

Samuel D. Koonce—Mgr., Market Research Div., Jefferson Chemical Co., Inc., New York, N. Y.

Marcel F. L'Heureux—Chemist, Bates Mfg. Co., Augusta, Maine.

Robert Q. Ranson—Tech. Sales Repres., Southern Dyestuff Corp., Charlotte, N. C.

Peter Van S. Rice—Product & Process Develop., A. H. Rice Co., Pittsfield, Mass.

William H. Stone—Salesman, National Starch Products, Inc., New York, N. Y.

Matthew E. Walach—Dyer, Vesta Underwear Co., Pawtucket, R. I.

STUDENT

Ralph W. Burbank—Bradford Durfee Technical Institute. Sponsor: James Watters.

Richard E. Hart—Bradford Durfee Technical Institute. Sponsor: James Watters.

Daniel A. Lima—Bradford Durfee Technical Institute. Sponsor: James Watters.

Edward W. Makuch—Bradford Durfee Technical Institute. Sponsor. James Watters.

William A. Renaud—Bradford Durfee Technical Institute. Sponsor: James Watters.

Harold C. Hart—Bradford Durfee Technical Institute. Sponsor: James Watters.

Helen I. Brown—Utica Technical Institute.

Jay A. Sherman—Utica Technical Institute.

Donald Revere Roberts—Institute of Textile Technology. Sponsor: George H. Coleman.

Arthur S. Ashley—New Bedford Textile Inst. Sponsor: Francis Tripp.

Alfred Carter—New Bedford Textile Inst. Sponsor: Francis Tripp.

Shelden H. Cohen—New Bedford Textile Inst. Sponsor: Francis Tripp.

Arthur A. Dunham—New Bedford Textile Inst. Sponsor: Francis Tripp

Anibal L. Ferreira—New Bedford Textile Inst., Sponsor: Francis Tripp.

Lindsey S. Gifford, Jr.—New Bedford Textile Inst. Sponsor: Francis Tripp.

Morris N. Hahn—New Bedford Textile Inst. Sponsor: Francis Tripp.

Stephen R. Hall, Jr.—New Bedford Textile Inst. Sponsor: Francis Tripp.

John H. Hadley—New Bedford Textile Inst. Sponsor: Francis Tripp.

Francis M. Hinds—New Bedford Textile Inst. Sponsor: Francis Tripp.

William Isherwood, Jr.—New Bedford Textile Inst. Sponsor: Francis Tripp.

Rodney T. King—New Bedford Textile Inst. Sponsor: Francis Tripp.

James W. Lentz—New Bedford Textile Inst. Sponsor: Francis Tripp.

Joseph F. Marshall—New Bedford Textile Inst. Sponsor: Francis Tripp.

Raymond A. Normandin—New Bedford Textile Inst. Sponsor: Francis Tripp.

Robert V. Partington—New Bedford Textile Inst. Sponsor: Francis Tripp.

Roland E. Sasseville—New Bedford Textile Inst. Sponsor: Francis Tripp.

Norman W. Taylor, Jr.—New Bedford Textile Inst. Sponsor: Francis Tripp.

Gerald F. Barry—Lowell Textile Institute. Sponsor: E. E. Fickett.

Frederick D. Brown—Lowell Textile Institute. Sponsor: E. E. Fickett.

Frank J. Craven, Jr.—Lowell Textile Institute. Sponsor: E. E. Fickett.

Bruce O. Dickison—Lowell Textile Institute. Sponsor: E. E. Fickett.

Joseph J. Ducharme—Lowell Textile Institute. Sponsor: E. E. Fickett.

Leonard I. Gilman—Lowell Textile Institute. Sponsor: E. E. Fickett.

Walter L. Hochner—Lowell Textile Institute. Sponsor: E. E. Fickett.

Wayne H. Lawson—Lowell Textile Institute. Sponsor: E. E. Fickett.
Donald J. McCartney—Lowell Textile Institute. Sponsor: E. E. Fickett.
Charles D. Nelson—Lowell Textile Institute. Sponsor: E. E. Fickett.
John T. O'Donnell—Lowell Textile Institute. Sponsor: E. E. Fickett.
Robert M. Profio—Lowell Textile Institute. Sponsor: E. E. Fickett.
Eric A. Schlaginhaufen—Lowell Textile Institute. Sponsor: E. E. Fickett.
Bernard E. Therrien—Lowell Textile Institute. Sponsor: E. E. Fickett.
Francis P. Tully—Lowell Textile Institute. Sponsor: E. E. Fickett.
James W. Whitworth—Lowell Textile Institute. Sponsor: E. E. Fickett.
Mustafa E. Yumlu—Lowell Textile Institute. Sponsor: E. E. Fickett.
Emanuel Goldstein—Rhode Island School of Design. Sponsor: H. B. Sturtevant.
Raymond J. Tucci—Rhode Island School of Design. Sponsor: H. B. Sturtevant.
David Herman—Philadelphia Textile Institute. Sponsor: P. Theel.
John W. Kirk—Philadelphia Textile Institute. Sponsor: P. Theel.
Jerome Klein—Philadelphia Textile Institute. Sponsor: P. Theel.
Morton Linzer—Philadelphia Textile Institute. Sponsor: P. Theel.
Harold J. Prensky—Philadelphia Textile Institute. Sponsor: P. Theel.
Robert H. Rosenberg—Philadelphia Textile Institute. Sponsor: P. Theel.
Bernard Scheffler—Philadelphia Textile Institute. Sponsor: P. Theel.
Howard A. Strauch—Philadelphia Textile Institute. Sponsor: P. Theel.
Donald Winslow—Philadelphia Textile Institute. Sponsor: P. Theel.
Bernard D. Corbeil—St. Hyacinthe Textile School. Sponsor: George Boulé.
Gerard Jacob—St. Hyacinthe Textile School. Sponsor: George Boulé.
Gilles Roux—St. Hyacinthe Textile School. Sponsor: George Boulé.
Abie Shuster—St. Hyacinthe Textile School. Sponsor: George Boulé.
Rodrigue Smith—St. Hyacinthe Textile School. Sponsor: George Boulé.
Yvon P. St. Louis—St. Hyacinthe Textile School. Sponsor: George Boulé.
Donald C. Anderson—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Joseph V. Brice—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Rodney L. Coleman, Jr.—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Arnold C. Corwin—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Robert E. Crowell—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
George H. Eudy—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Harold F. Keels—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Veeriah Kota—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Jack L. Link—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Harry L. Mercer—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Robert L. Polk—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Gaston M. Randolph—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Joe H. Schell—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Arthur H. Shein—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
John G. Templeton—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Gordon Watt, Jr.—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Peyton P. White—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
David L. Wood—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
Emerson M. Yelton—North Carolina State College of A. & E. Sponsor: H. A. Rutherford.
James L. Bridgeman—Clemson College. Sponsor: Joseph Lindsay, Jr.
Thomas Carter—Clemson College. Sponsor: Joseph Lindsay, Jr.
Charles E. Coleman—Clemson College. Sponsor: Joseph Lindsay, Jr.
Billy G. Estes—Clemson College. Sponsor: Joseph Lindsay, Jr.
Thomas L. Howle, Jr.—Clemson College. Sponsor: Joseph Lindsay, Jr.
Hugh M. Tobin—Clemson College. Sponsor: Joseph Lindsay, Jr.
Harry H. Tyler—Clemson College, Sponsor: Joseph Lindsay, Jr.
Jerome V. Bennett—Georgia Inst. of Technology. Sponsor: C. A. Jones.
Gordon B. Fowler—Georgia Inst. of Technology. Sponsor: C. A. Jones.
Randolph P. Griffin—Georgia Inst. of Technology. Sponsor: C. A. Jones.
Alberto Handal—Georgia Inst. of Technology. Sponsor: C. A. Jones.
Donald L. Lyle—Georgia Inst. of Technology. Sponsor: C. A. Jones.
Winton C. Sessions—Georgia Inst. of Technology. Sponsor: C. A. Jones.
Howard L. Weathers, Jr.—Georgia Inst. of Technology. Sponsor: C. A. Jones.

Applications for Transfer to Senior Membership:

Richard C. Davis, William T. Haggerty, R. George Hochschild, Robert H. Johnson, James C. Jordan, Edwin H. Keller, Fred K. Quigley, Jr.

CALENDAR

COUNCIL

Meeting: January 13 (New Yorker, New York).

RESEARCH COMMITTEE

Meeting: January 13 (New Yorker, New York).

NATIONAL CONVENTIONS

1950: September 28 to 30, Portsmouth, N. H
1951: October 18 to 20, Statler, New York
1952: Boston.

NEW YORK SECTION

Meetings: Jan. 13 (Hotel New Yorker, New York), Mar. 3 (Hotel Statler, New York), April 14, May 5 (Kohler's Swiss Chalet, Rochelle Park, N. J.), June 16—Outing.

NORTHERN NEW ENGLAND SECTION

Meeting: Jan. 27, (Hotel Vendome, Boston).

PHILADELPHIA SECTION

Meetings: January 13, February 24, March 31, May 5 (Kugler's, Philadelphia), June 9 (Annual Outing), October 13, December 8, January 17, 1951.

PHILADELPHIA TEXTILE INSTITUTE STUDENT CHAPTER

Meetings: January 11, February 1, March 1, March 29, April 26, and May 24.

PIEDMONT SECTION

Meetings: Jan. 21 (Poinsett Hotel, Greenville, S. C.), April 1 (Robert E. Lee Hotel, Winston-Salem, N. C.), June 30-July 1 (Ocean Forest Hotel, Myrtle Beach, S. C.).

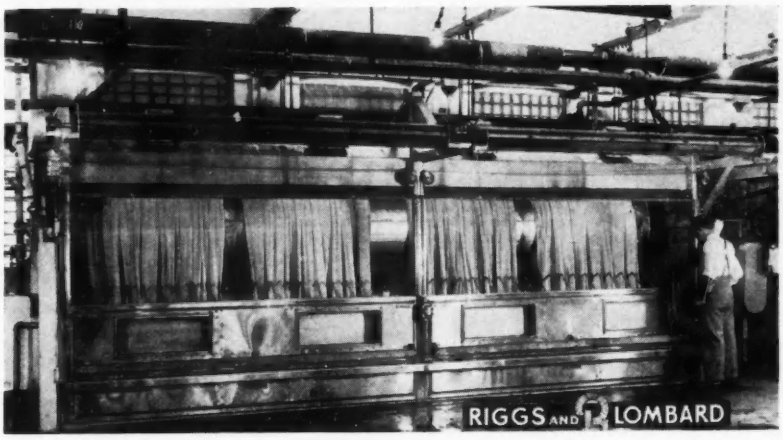
SOUTH CENTRAL SECTION

Meeting: February 18, (Hotel Patten, Chattanooga, Tenn.)

WESTERN NEW ENGLAND SECTION

Meetings: January 27 (Rapp's Restaurant, Shelton, Conn.), March 10 (Waterbury, Conn.), April 14 (Rapp's Restaurant, Shelton, Conn.) May 26 (Waverly Inn, Cheshire, Conn.) June 23 (Outing at Wallingford, Conn. Country Club).

TRADE NOTES • NEW PRODUCTS



R & L Piece Dye Kettle

• Twenty Foot Piece Dye Kettle

Two 20' long Type TLBT Fleet Line Piece Dye Kettles have recently been installed in a New England mill by Riggs & Lombard, Inc. of Lowell, Mass. This dye kettle is believed to be one of the largest of its type ever made.

It is used for dyeing staple and filament acetate rayon and blended fabrics, and is said to handle up to 40 pieces at one time. The reel is 42" in diameter and of the solid drum type with all-over knurled surface. The knurling prevents slippage of the fabrics which are dyed in this machine, thus eliminating the need of wrapping the reel with cloth, it is stated. The machine has a Vari-V type motor drive and the doffer roll is also individually motor driven. Other features of interest are ladder guides of the positive knock-off type, and a tub designed to eliminate tangles and promote free ballooning of the fabrics. The machine is of all stainless steel construction.

• Fluorescent Materials Used as Tracers

Use of fluorescent dyes as tracer materials in felt has been suggested by R. R. Stevens, chief research and development engineer of The Felters Company. White wool reportedly may be dyed or treated with such materials which are said to be invisible in ordinary light but are immediately revealed upon exposure to ultraviolet light. Added in desirable proportions to untreated wools, previous to manufacture, this technique provides a new tool for studies in felting and other uses such as product identification, Mr. Stevens told the felt section of the American Society for Testing Materials at its recent meeting in Detroit.

"At various stages in manufacture, such blended felts may be examined under ultraviolet light to trace travel of fiber, to locate experimental lots, to identify face and back constructions and to measure the tendency of various wools in felt constructions to come to the surface of the felt," Mr. Stevens declared. "Outside the field of testing, the use of small portions of fluorescent wools could conceivably be used by a manufacturer to identify his product without knowledge of the consumer."

Mr. Stevens further stated that the advantage of such methods of testing and identification is the absence of discoloration of white felts, its permanence and the lessening of bias in judging or processing of sample runs. The use of fugitive stains in marking of sample runs is said to be improved because identification of white materials can be carried through to the finished stage, whereas fugitive color stains are removed in some intermediate stage of manufacture.

Such identifying techniques are reported relatively inexpensive. Compounds are applied in water solutions, rather than solvents. Identifying ultra violet bulbs is said to cost only a few dollars. It was stated that there are also possibilities of applying such compounds during carbonizing or as an after-treatment during wool scouring."

Gerald S. Tompkins

• Tompkins New Avisco V. P.

Gerald S. Tompkins has been elected a vice-president of American Viscose Corporation. Mr. Tompkins, since 1947, has been general maanger of viscose rayon production and a member of the board of directors.

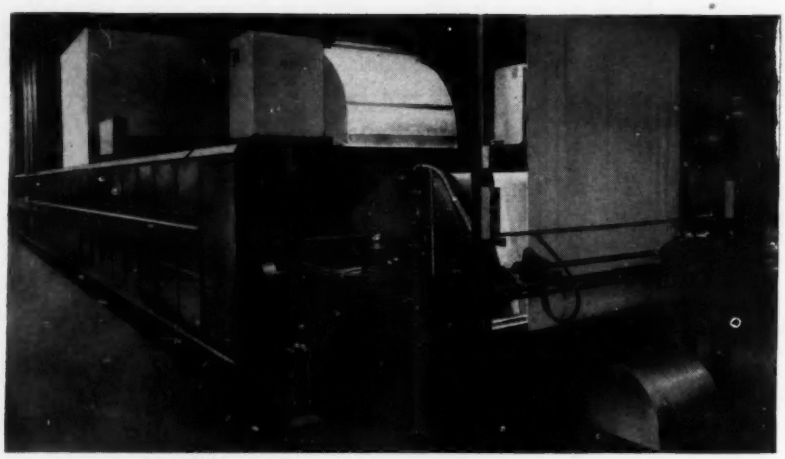
• New W. C. & C. Office Opened

The new office and warehouse of the Woonsocket Color & Chemical Co., Woonsocket, R. I., has been opened at 6100 State Road in Philadelphia and will be in charge of Mitchell Stead.

• Wyandotte Seminar

The fourth annual Research and Development Division Seminar of Wyandotte Chemicals Corporation, held November 20-21 at the Detroit Statler, featured an exhibit, "Research In Action", reports from the Company's Plant Research Department and from the Controller's Division, and a discussion of the Company's current research and development program. Robert L. Taylor, editor of Chemical Industries, was the featured speaker at the banquet. He spoke on "Some Chemical Industry Trends."

Booths covered the following subjects, among others: synthesis of glycol derivatives, comparative performance of synthetic detergents, miniature rug washing machine, inhibited alkalies, glycol production, detergent-sanitizers, patent procedures, research library services, instruments for controlling solution strength, scale model of Wyandotte's new continuous process CMC production unit and visco-elastic properties of textiles.



Entering End, Butterworth Ripple-Flo Tenter Range.

• Electronically-Controlled Pin Tenter Overfeeding

The first reported mill installation of pin tenter overfeeding under electronic control is said to have completed a three-month trial run and the results have been made available by engineers of H. W. Butterworth & Sons Company, 2417 E. York St., Philadelphia 25, Pa., who designed and built the range. The company report follows:

"The range is in operation on all-purpose drying, shrinkage control, resin finishes, water repellents and permanent finishes in a large Southern mill. It runs efficiently at speeds up to 100 yards per minute with overfeed accurately controlled from 0 to 25%. Selvage tolerance is 1/16-inch (plus or minus) on the pin line.

"The handle of the fabric is greatly enhanced after processing on the Butterworth Ripple-Flo Tenter Range. It gives fabrics the optimum relaxed finish. The two-dimensional control is amazingly precise.

"Materials processed by overfeed tenter in this mill include mixed fabrics and spun rayon. The new range has also been used successfully on worsteds, laces and viscose and acetate rayon.

"In the conventional pin tenter range, rail guiders are controlled by finger contact on the cloth selvage. On light materials, this conventional control is insensitive to small changes in the cloth position and the contact finger curls or distorts the selvage to a degree that seriously affects the accuracy with which it is put on the pins.

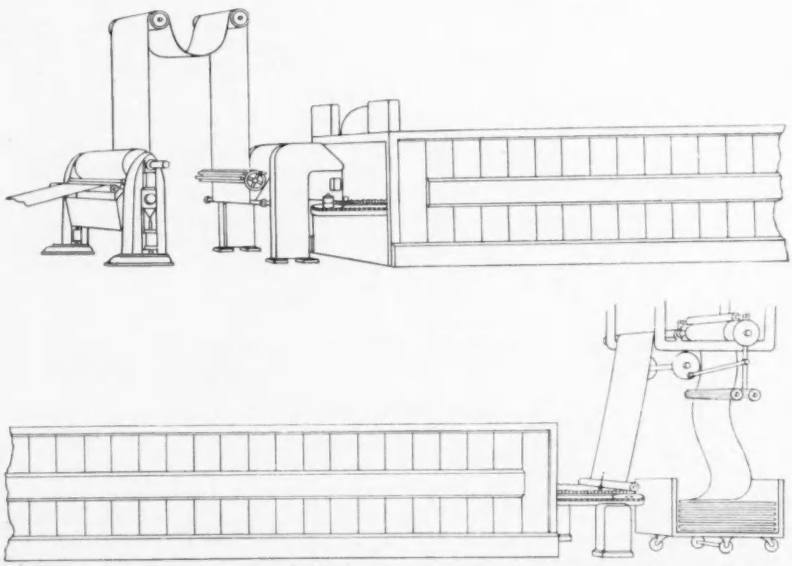
"In the new Butterworth Ripple-Flo Tenter Range, the rail guiders are actuated by a photoelectric beam on the selvage line. The edge of the cloth is scanned by a photoelectric device called a scanning head. The signal from this scanning head is amplified and actuates a sequence of electronic circuits which keep the tenter pin line in register with the selvage. The "Micro-Eye" Control operates as well on light materials as on heavy ones. Cloth color is of little or no consequence in this type of photoelectric control. Material with an open selvage construction is also handled successfully.

"There are no moving parts in the control system, so little or no maintenance is required. In comparison with the hydraulic system used in conventional overfeed pin tenters, the electrical controls are extremely simple in operation.

"The overfeed system in the Butterworth Ripple-Flo Tenter Range does not depend on a brush drive arrangement. It uses instead overdriven feed rolls ahead of the tenter brushes. The feed rolls are driven in conjunction with the tenter drive to give perfect coordination at all speeds. A dial indicator calibrated in per cent of overfeed makes accurate setting a simple matter.

"The whole width of the material is under positive control up to the brushes and bow is kept to a minimum. This emphasis on cloth control increases the pin line accuracy and practically eliminates 'guider hunting.' It also keeps the pin line constant in relation to the selvage, regardless of cloth speed or overfeed.

"Special brush construction in the Ripple-Flo Tenter Range makes it possible to pick up any selvage that comes off the pins at an irregular seam and put it back on the pin lint automatically. It also facilitates piecing up when the tenter is put into operation."



Drawing of Butterworth Ripple-Flo Tenter Range, Showing End Arrangement, Tenter Housing and Delivery End.

• Russell New Metrotex Prexy

Metrotex, Inc. of Bayway Terminal, Elizabeth, New Jersey, reports that Charles F. Russell, the Treasurer and General Manager, has been appointed President of the Company in place of William A. Dawson, resigned. Mr. Russell was formerly Vice President of the Metakloth Company of Lodi, New Jersey; he will now combine the offices of President and Treasurer.

The Company further reports that the Board has appointed Henry J. Franklyn as Vice President in charge of Sales. Mr. Franklyn was formerly connected with the Willesden Proofing Company.

• Textile Machinery Exhibition

The American Textile Machinery Exhibition will be held in Atlantic City, New Jersey, May 8 to 12, 1950, under the auspices of the National Association of Textile Machinery Manufacturers. It will be staged in the Atlantic City Auditorium, one of the most modern exhibition buildings in the world, which is located on the Boardwalk.

The exhibition will be one of the largest shows of its kind ever held and will exhibit to the textile industry all over the world the latest machinery: looms, winding, dyeing, finishing and drying machinery, mill supplies and allied products. Staged for the entire trade, the exhibition will be international in scope and it is anticipated that buyers and sellers of the textile industry from all over the world will attend. Under one roof will be concentrated the best creative thought of the textile machinery industry, the latest ideas and designs, the latest developments and methods in machinery and equipment. All exhibits will be in operation.

The Exhibition Committee is headed by Erwin N. Darrin, Vice-President of Draper Corporation, Hopedale, Mass., as Chairman. Other members are:

J. Hugh Bolton,
President, Whitin Machine Works, Whitinsville, Mass.

Frederic W. Howe, Jr.
Vice-President, Crompton & Knowles Loom Works, Worcester, Mass.

J. Frank Lowell,
Vice-President, Saco-Lowell Shops, Boston, Mass.

Winthrop S. Warren,
Sales Manager, Universal Winding Co., Providence, R. I.

W. H. Rometsch, Jr.
Secretary and Treasurer, Fletcher Works, Inc., Philadelphia, Pa.

R. G. Ross,
Sales Manager, Textile Division, Barber-Colman Co., Rockford, Ill.

Edgar A. Terrell,
President, Terrell Co., Charlotte, N. C.

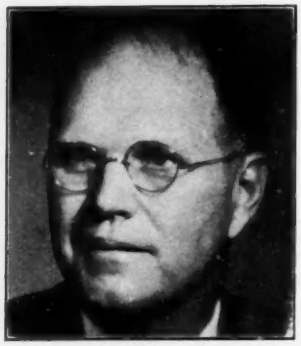
From all indications, the attendance by company executives, mill officials, sales managers, and key men in all branches and departments of the textile trade will be tremendous. It is stated that many of the large textile mills throughout the country are planning to send groups of their superintendents, overseers and foremen to the exhibition.

Persons intending to visit the exhibition are urged to communicate promptly with the Housing Secretary, 16 Central Pier, Atlantic City, New Jersey, for room reservations. While Atlantic City is one of the largest seaside resorts in the world and possesses many fine hotels, facilities are frequently exhausted when exhibitions of the size and scope of the American Textile Machinery Exhibition are held. *It is important that those planning to visit the exhibition write to the Housing Bureau promptly, indicating the number of rooms desired.* Applications for rooms will be assigned promptly and acknowledged.

Admission to the exhibition is free to everyone in the textile industry. Tickets may be obtained in any quantity desired, either by communicating with Albert C. Rau, Manager, Campbell-Fairbanks Exposition, 322 Park Square Building, Boston, Mass., or with any of the exhibitors.

Approximately two hundred leading manufacturers of the textile machinery industry will exhibit their products. The following is a list of exhibitors:

Abbott Machine Company
Abington Textile Machinery Works
Acrometal Products, Inc.
Allen Company
The Allentown Bobbin Works
Allis-Chalmers Manufacturing Co.
Aluminum Company of America
American Dyestuff Reporter
American Paper Tube Company
The American Pulley Company
American Textile Engineering, Inc.
American Wool & Cotton Reporter
Ashworth Brothers, Inc.
Ateliers Roannais de Constructions Textiles
Atkinson Haserick & Company
W. H. Bagshaw Company
The Bahnson Company
Barber-Colman Company
Bijur Lubricating Corporation
Birch Brothers, Inc.
William Birch, Ltd.
Benjamin Booth Company
Buensod-Stacey, Inc.
The Bunting Brass & Bronze Co.
Burlington Engineering Co., Inc.
H. W. Butterworth & Sons Co.
A. B. Carter, Inc.
Century Electric Company
Chapman Electric Neutralizer Co.
Clinton Foods, Inc.
Cocker Machine & Foundry Co.
Container Corporation of America
Continental-Diamond Fibre Co.
Cook-P & N Machine Co., Inc.
William Crabb & Co.
Crocker Wheeler Electric Mfg. Co.
Crompton & Knowles Loom Works
Curtis & Marble Machine Co.
Cutler-Hammer, Inc.
Davis & Furber Machine Co.
Davison Publishing Company
The Dayton Rubber Company
Diehl Manufacturing Company
Dixon Lubricating Saddle Co.
Draper Corporation
Duesberg-Bossom of America
E. I. du Pont de Nemours & Co., Inc.
Durant Manufacturing Company
Elastic Stop Nut Corporation of America
Eriez Manufacturing Company
The Fafnir Bearing Company
Fairchild Publications
The Felters Company
Fletcher Works, Inc.
Foster Machine Company
The Foxboro Company
The Fuller Brush Company
General Electric Company
David Gessner Company
The Girdler Corporation, Inc.
Graton & Knight Company
Grinnell Company, Inc.
H. & B. American Machine Company
Ernest M. Hahne
Hart-Moisture-Meters
George S. Harwood & Son
Hayes Industries, Inc.
The Hermas Machine Company, Inc.
Herr Manufacturing Co., Inc.
Holdsworth Gill Screw Co., Inc.
R. H. Hood Company
E. F. Houghton & Company
Howard Brothers Manufacturing Company
Hubbard Spool Company
Philip V. Hugues & Sons
Rodney Hunt Machine Company
James Hunter Machine Company
Hyatt Bearings Division, General Motors Corporation
The Industrial Dryer Corporation
Industrial Steels, Inc.
M. W. Jenkins Sons, Inc.
Kearny Manufacturing Co., Inc.
The Kent Company
Walter Kidde & Company, Inc.
Oscar Kohorn & Co., Ltd.
Lacy, Atherton & Davis
Lamberth Rope Corporation
W. T. Lane & Bros., Inc.
F. A. Lazenby & Co.
Thomas Leland Machinery Co., Inc.
Lestershire Spool & Mfg. Co.
Lincoln Engineering Company
Link Belt Company
Lockwood Greene Engineers, Inc.
Lydon Brothers, Inc.
McGlynn-Hays Industries
Macbeth Corporation
Manton-Gaulin Mfg. Co., Inc.
The Marquette Metal Products Co.
Marshall & Williams Corporation
Meese, Inc.
Micro-Lite Co., Inc.
A. Milne & Company
Milton Machine Works
Minneapolis-Honeywell Regulator Co.
Morrison Machine Company
Morse Chain Company
Mount Hope Machinery Company
Muschamp Taylor, Ltd.
The National Drying Machinery Co.
New Departure Division, General Motors Corporation
New York & New Jersey Lubricant Co.
John P. Nissen, Jr. Co.
Norcross Corporation
Oakite Products, Inc.
Optical Associates
P. O. M. Company
Panamerican Publishing Company
Parks-Cramer Company
Penick & Ford, Ltd., Inc.
B. F. Perkins & Son, Inc.
Plastomatic Corporation
Pneumafil Corporation
Proctor & Schwartz, Inc.
Progressive Machine Co., Inc.
Rayon & Synthetic Textiles
Reeves Pulley Co., Inc.
F. L. Regnery Corporation
Robert Reiner, Inc.
Republic Steel Corporation
J. E. Rhoads & Sons
Rice Barton Corporation
Joh. Jacob Rieter & Co., Ltd.
Riggs & Lombard, Inc.
B. S. Roy & Son Company
Rudell Machinery
S K F Industries, Inc.
Saco-Lowell Shops
Saentis, Inc.
Sarco Co., Inc.
C. G. Sargent's Sons Corporation
Schmidt Manufacturing Company
Scott Testers, Inc.
Shell Oil Company, Inc.
Singer Sewing Machine Company
James Smith & Sons, Inc.
Smith, Drum & Company
Societe Anonyme Adolphe Saurer
Sonoco Products Company
Standard Mill Supply Company
Standard Pressed Steel Company
Steel Heddle Manufacturing Company
Sterling-Engineering & Manufacturing Company
Stewart-Warner Corporation
Synthane Corporation
The Takk Corporation
Taylor Instrument Companies
G. H. Tenant Company
The Terrell Machine Company
The Texas Co.
Textile Age
Textile Bulletin
Textile Industries
Textile World
Ton-Tex Corporation
Trumeter Company
U. S. Bobbin & Shuttle Company
U. S. Gutta Percha Paint Company
U. S. Textile Machine Company
Universal Winding Company
Uster Corporation
Van Vlaanderen Machine Company
Veeder-Root, Inc.
Venango Engineering Co., Inc.
Victor Ring Traveler Company
Walker Manufacturing Co., Inc.
Walton Laboratories, Inc.
The Warner & Swasey Company
Watson & Desmond
Watson-Williams Mfg. Company
Waukesha Foundry Company
Werner Textile Consultants
Westinghouse Electric Corporation
Whitin Machine Works
Wiltex, Inc.
Winsor & Jerauld Mfg. Company
Yale & Towne Manufacturing Company
York Corporation



Eger V. Murphree

• Murphree 1950 Perkin Medalist

Eger V. Murphree, president of Standard Oil Development Company, central research affiliate of Standard Oil Company (New Jersey), was presented with the Perkin Medal for 1950 by the American Section of the Society of Chemical Industry at the Waldorf-Astoria Hotel last week.

The Perkin Medal, the highest award of the Society, was presented to Mr. Murphree by Dr. Marston T. Bogert, senior Past President. The dinner meeting, held in the Starlight roof, was a joint affair of the American Chemical Society, American Institute of Chemical Engineers, the Electrochemical Society and the American Section of the Society of Chemical Industry.

The meeting was presided over by the Chairman of the American Section, Dr. Gustavus J. Esselen. Dr. Warren K. Lewis, former head of the Department of Chemical Engineering, Massachusetts Institute of Technology, spoke on "The Medalist and His Accomplishments" following a paper delivered by Mr. Murphree entitled "Adventures in Applied Chemistry".

The Perkin Medal was founded in commemoration of the 50th anniversary of the coal tar color industry, 1856-1906, and may be made to any member of the chemical profession residing in the United States for outstanding work done at any time during his career. Mr. Murphree was the forty-fourth recipient of the medal.

E. V. Murphree is the holder of some twenty-one patents ranging from obtaining oxidation products from hydrocarbons to method and apparatus for contacting solids and gases. He has published more than twenty-five scientific papers on such varied subjects as synthetic rubber, catalytic cracking and application of the Fluid solids technique to producing synthetic liquid fuels.

Mr. Murphree was born November 3, 1898, in Bayonne, New Jersey, and is a graduate of the University of Kentucky.

• DCAT Seal to be Used in Advertising

As a service to its members, the Drug, Chemical and Allied Trades Section of the New York Board of Trade, Inc., is now issuing reproductions of a seal designating membership in the Association, for use in advertising.

A letter informing the membership of this decision has been sent out and copies of the seal in several sizes suitable for various types of publications are now available. Any member wishing to use the seal can obtain a plate in one of several recommended sizes by writing Miss Helen L. Booth, Secretary, Drug, Chemical & Allied Trades Section, New York Board of Trade, Inc., 191 Broadway, New York 7, New York.

DCAT Seal

• Derrig NE Sales Manager

John J. Derrig has been appointed Sales Manager of the New England territory for the Textile Resin Department of American Cyanamid Company. For the past five years, Mr. Derrig has been technical salesman for the metropolitan territory.

Mr. Derrig is a graduate of Bradford-Durfee Technical Institute, Fall River, Massachusetts, and Pratt Institute, Brooklyn, New York. His previous experience was with J. C. Penney Co. as textile chemist and Johnson & Johnson, in development and management.

Alden Nute has been made New England technical service manager.

• ACC Appoints Dr. Miller

American Cyanamid Company announces the appointment of Dr. Wilbur H. Miller as technical representative and assistant manager of the Company's Washington, D. C. office. Dr. Miller will act as liaison between the various governmental laboratories and the American Cyanamid Company's technical facilities. He has been on the staff of Cyanamid's Stamford Research Laboratories since 1941.

Morris S. Rosenthal

• Rosenthal to Serve in Heart Campaign

Morris S. Rosenthal, president of Stein, Hall & Company, Inc., will serve as Chairman of the Exports and Imports Division of the 1950 New York Heart Campaign. Mr. Rosenthal's acceptance of the post was announced by William C. Langley, Chairman of the Commerce and Industry Committee of the New York Heart Campaign, which begins officially on February 14th. Mrs. Arthur Baer is General Chairman of the drive to raise $750,000 in the fight against heart disease through a program of research, service and education.

Mr. Rosenthal was Assistant Director of the Board of Economic Warfare in charge of Office of Imports from December of 1941 to August, 1943. He is President of the National Council of American Importers; a Trustee of the United States Council of International Chamber of Commerce; Vice Chairman of the Foreign Commerce Department Committee and member of the Policy Committee of the Chamber of Commerce of the United States. Mr. Rosenthal is a former lecturer on Foreign Trade at Columbia University and the College of the City of New York. He also is the author of "Technical Procedure in Exporting and Importing," as well as a contributor to various publications.

• New Director and Assistant Chiefs

Appointment of Dr. Walter M. Scott and Dr. John R. Matchett as assistant chiefs of the U. S. Department of Agriculture's Bureau of Agricultural and Industrial Chemistry was announced by Dr. G. E. Hilbert, chief of the Bureau. He announced also that Dr. Charles H. Fisher would succeed Dr. Scott as director of the Bureau's Southern Regional Research Laboratory in New Orleans. The appointees will begin their new duties January 3, 1950.

Dr. Scott, who has directed the New Orleans laboratory for the past three years, will serve in Washington as coordinator of the Bureau's Research on utilization of cotton, other fiber crops, and agricultural residues, Dr. Hilbert said.

Dr. Matchett, formerly coordinator of food research at the Bureau's Western Regional Research Laboratory in Albany, Calif., came to Washington recently as technical advisor to the Bureau chief. In his new position, Dr. Hilbert stated, he will coordinate the Bureau's work on utilization of fruits and vegetables at the four Regional Research Laboratories and at a number of Bureau field stations in various parts of the country.

Dr. Fisher, now head of the Carbohydrate Division of the Bureau's Eastern Regional Research Laboratory at Wyndmoor, Pa., will move to New Orleans to direct investigations at the Southern Laboratory on new and wider uses for cotton and other Southern crops.

The new appointments, Dr. Hilbert pointed out, will increase to four the number of the Bureau's assistant chiefs for research. Carl F. Speh and Dr. George W. Irving, Jr., are already serving in this capacity. The Bureau also has an assistant chief for administration, Henry A. Donovan.

With the appointment of two additional assistant chiefs, Dr. Hilbert said, the Bureau will be better able to hanlle its rapidly expanding research program. He stated that each of the four assistant chiefs for research would be responsible for coordinating and developing the Bureau's work on crop uses within certain commodity fields, which in many cases cross regional lines.

Thomas Autometer

• Instrument Warns Against Air Pollution by Sulfur Dioxide

Industrial plants which discharge gases containing sulfur dioxide reportedly can be warned against atmospheric pollution by means of a new automatic analyzing equipment developed by Dr. M. D. Thomas of American Smelting & Refining Co. (U. S. Patent 2,462,293). The equipment is said to employ a thoroughly field-tested principle, and is now available for the first time as a complete assembly manufactured by Leeds & Northrup, 4934 Stenton Ave., Philadelphia 44, Pa., as the Thomas Autometer. This equipment continuously records actual concentration of sulfur dioxide in parts per million; and, as further evidence of accuracy of measurement, it also records average concentration integrated over a half hour period, automatically checks its "zero reading" every thirty minutes, and marks off each cubic foot of air sampled, the company states.

Usual range of the equipment—0 to 5 parts SO_2 per million—reportedly covers the concentrations which are of interest in pollution surveys. Changes in concentration as small as a few tenths of a part per million can be readily detected, it is stated.

Unlike most gas-analyzers, the Autometer is said to make use of electrolytic conductivity as a means of measurement. A continuous sample of air is passed through a solution which absorbs SO_2, causing a change in the electrolytic conductivity of the solution.

The recording instrument is a Micromax recorder of the same basic type as those which are used in other industrial applications. It is said to require only nominal attention consisting of occasional oiling, cleaning, and replacement of ink and chart.

For further information, write to Leeds & Northrup Company.

• CCNY to Continue Converting Course

The training program in "Fundamentals of Textile Converting", said to provide a practical working knowledge of both natural and synthetic textiles, will be offered again during the 1950 Spring Term at the City College Midtown Business Center, 430 West 50th Street, New York 19, N. Y.

This program, presented for the first time in the 1949 Fall Term, proved so successful that Dr. Robert A. Love, Director of the Evening and Extension Division, City College School of Business, authorized its repetition. The course reportedly provides a practical perspective of converting techniques to those persons interested in the converting of fabrics from the raw to the finished state.

The trainees gain guidance through individual instruction in an informal workshop under the supervision of Herbert D. Wojan, a Textile Consultant with more than 30 years experience in the Textile Industry. Through guest lecturers provided by the Industry, together with visual teaching aids and field trips, the trainees acquire a knowledge of fibers, yarns, fabric construction, types of fabrics, dyeing and printing, finishing processes, special and functional finishes, converting procedures, converting problems, and standards for the examination of finished goods.

For further information, write to the Supervisor of Admissions, City College Midtown Business Center, 430 West 50th Street, New York 19, N. Y.

• Onorati Named to New A.I.L. Post

Frank P. Onorati has been named Manager of the New York Textile Approval Division of the American Institute of Laundering, national trade association of the laundry industry with headquarters in Joliet, Illinois.

As manager of the New York Textile Approval Division of the A.I.L., Mr. Onorati will direct the sales and promotion of the "Certified Washable" Seal of Approval. The Certified Washable Seal is a consumer's label testifying to quality of cloth, color fastness, shrinkage, construction and general launderability. It is awarded to products that pass rigid

CCNY Students Watch Printing Demonstration

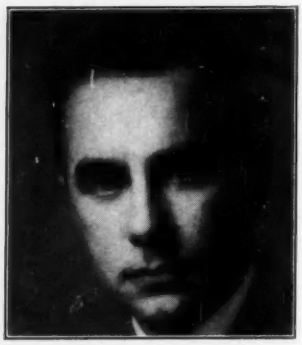


Photo by Raymond K. Martin, N. Y.

Frank P. Onorati

tests in the Institute's laboratory. The Seal is applicable to products affecting wear and washability, such as deodorant creams, as well as washables.

Mr. Onorati joined the A.I.L. in December, 1947, as advertising and promotion manager of the Seal Division. Prior to this, he was managing editor of two laundry trade publications. During the war he served four years with the Army Public Relations Division and was honorably discharged as a Major.

He replaces James C. Stirling, who has entered the import-export business.

• Nathan Interviewed on Television

Ernest Nathan, president of the Warwick Chemical Company recently interviewed by Kathi Norris on her daily television program, "Your Television Shopper", explained the basic principles of water repelling fabrics and demonstrated an actual spray test. The progress of rainwear through the ages was also discussed and several museum pieces of various types of rain garments were televised.

• Hoffman Joins Interchemical

Henry C. Hoffman, formerly manager of Santee Print Works, has joined the Textile Colors Division of Interchemical Corporation as technical representative, with headquarters at the Rock Hill, S. C., office of the Division. After his graduation from Clemson College, Mr. Hoffman was with Hartsville Print & Dye Works for eight years, becoming superintendent of printing. During World War II he served in the U. S. Army, with rank of Captain. From 1946 to 1948 he was night superintendent of Clearwater Finishing Co. Mr. Hoffman will make his home at 2630 Weldon Drive, Chattanooga, Tenn.

• Terry Named Manager

Daniel H. Terry, a process development chemist in the company's Grasselli, N. J. plant since September, 1945, has been made Manager, Technical Service for Antara Products, General Aniline & Film Corporation, 444 Madison Avenue, New York City.

Dr. Terry, a research chemist for E. I. du Pont de Nemours & Co., from 1940 to 1945, investigated such problems as preparation of miscellaneous intermediates, vitamins and hormones, detergents and water repellents. As a process development chemist for General Aniline, he was concerned with textile auxiliaries, intermediates for azo, vat and other dyestuffs and also direct dyestuffs.

A Phi Beta Kappa from Randolph-Macon College, Dr. Terry received his Ph.D. in Organic Chemistry from the University of Virginia in 1940. He is a member of the A.C.S., the A.A.T.C.C. and several other scientific and social fraternities.

Ernest Nathan Being Interviewed by Kathi Norris On TV.

• Thornton New Peerless Manager

The Peerless Color Company, Plainfield, N. J., has announced the appointment of Ernest Thornton as Manager to succeed Arthur J. Buchanan who has retired on account of ill health.

OBITUARY

John A. Barrington

JOHN A. BARRINGTON

JOHN A. BARRINGTON, Manager of the New York Sales Branch of General Dyestuff Corporation, New York, N. Y., died at New Rochelle Hospital, New Rochelle, N. Y., on December 4, 1949. His age was 66 years.

Born in Lancashire, England, Mr. Barrington came with his family to Massachusetts in 1885, was educated in the public schools of the State, and took an evening course at Lowell Textile Institute. After service as a dyer at a woolen mill in Methuen, Mass., he entered the employment of Kuttroff, Pickhardt & Co. as a technician in 1904. In 1908 he joined the Boston branch of Kalle & Co. as a salesman. From 1911 to 1915 he was manager of its Philadelphia branch. He was transferred to New York as Sales Manager in 1916, and in 1918 took a position with the Geigy Company in Boston. Subsequently he became associated with the management of the Essex Chemical Works in South Middleton, Mass. After a period of retirement he joined the General Dyestuff Corporation on February 1, 1931, and became Manager of the New York Sales Branch in 1940. For a number of years he was Vice-President and Technical Director of the North American Dye Corporation, Mt. Vernon, N. Y., and a member of the American Association of Textile Chemists and Colorists. He leaves a widow, a daughter and two sons.

• Ellsworth Transferred

Arthur C. Ellsworth, Jr. has been transferred from Pittsburgh Plate Glass Company's Columbia Chemical Division plant at Barberton, Ohio to the development department at the firm's Natrium, West Virginia plant. Mr. Ellsworth has been associated with the firm's chemical division since his graduation from the University of Denver in 1940. A member of the American Institute of Chemical Engineers, Mr. Ellsworth holds the degree of B. S. in Chemical Engineering.

• Althouse Gift to PTI

A gift to The Philadelphia Textile Institute Foundation by Dr. C. Scott Althouse, President, Althouse Chemical Company, Inc., Reading, Penna., and an Alumnus of the Institute, class of 1900, in the amount of $27,804.50, was announced by Colonel Millard D. Brown, President of the Foundation.

The Organic Chemistry Laboratory in the new Institute Building will be named The Althouse Chemical Company Organic Chemistry Laboratory in honor of Dr. Althouse.

This laboratory of 2,491 square feet is on the second floor of the new building, and is under the direction of Professor Percival Theel, head of the Chemistry and Dyeing Department of the Institute.

Dr. Althouse is a member of the Alumni Association of the Philadelphia Textile Institute, having long been active in the interests of the school.

• I.G. Manufacturing Processes Made Public

Research Information Service, 509 Fifth Avenue, New York 17, N. Y., has issued a catalog listing 370 I.G. Farben manufacturing processes for chemical intermediates used in the production of dyes, textile auxiliaries, pharmaceuticals and other specialties as well as for complete color bases, and synthetic tanning agents. The translations reportedly give detailed instructions for industrial-scale preparation of these compounds and are enumerated in alphabetical order by the commercial and chemical names of the products to facilitate rapid selection. Most of the reports listed are priced at $2.00 and $3.00, with a few more lengthy publications ranging up to $6.00. Manufacturers and researchers desiring an opportunity ot avail themselves of this fund of technical knowledge are invited to write to Research Information Service for Research Bulletin No. 40, supplied free of charge.

• TRI Elections

At the Members' Annual Business Meeting of the Textile Research Institute, Inc., held December 1st at the Waldorf-Astoria Hotel, New York, the following Directors were elected for a term of three years each:

Norman C. Armitage, President, Deering Milliken Research Trust.

Andre Blumenthal, Vice President, Sidney Blumenthal & Company, Inc.

Ephraim Freedman, Director of Bureau of Standards, R. H. Macy & Company.

Thomas G. Hawley, Jr., Director of Research, United Merchants Laboratories, Inc.

G. P. Hoff, Manager, Technical Div., Rayon Dept., E. I. du Pont de Nemours & Co., Inc.

Jules Labarthe, Jr., Senior Fellow, Mellon Institute of Industrial Research.

Donald H. Powers, Director of Applied Research, William R. Warner & Co., Inc.

W. Bailey Sellars, Director of Research & Development, Burlington Mills Corp.

Among the group Messrs. Armitage, Blumenthal, Freedman, Hoff and Sellars were reelected. The newly elected members of the Board are Jules Labarth, Jr., Donald H. Powers and Thomas G. Hawley.

The election of Messrs. Hawley and Labarthe filled the vacancies on the Board of the completed terms of Messrs. Henry S. Grew, Jr., Vice President, Wellington Sears Company and C. J. Huber, Sanderson & Porter. The election of Mr. Powers was to fill the vacancy of Edward C. Pfeffer, Jr., Director of Research, Cluett, Peabody & Company, Inc.

These new members of the Board of Directors attended the Annual Meeting and participated in the discussion of the plans and program as discussed for the coming year.

Following the meeting A. G. Ashcroft, President, announced the reelection of all the Institute's officers for the coming year.

In addition to Mr. Ashcroft, Director of Research of Alexander Smith & Sons Carpet Co., the reelected officers are: Kenneth Wilson, Vice President of the Forstmann Woolen Co., Vice President; Richard T. Kropf, Vice President of Belding Heminway Company, Inc., Treasurer; and D. B. MacMaster, Public Relations Council, Secretary.

Mr. Ashcroft, in welcoming the newly elected members of the Board of Directors, brought to their attention the challenge of the rapidly increasing impact of research in the textile industry and the steady growth of the Textile Research Institute during the past four years.

William R. Tornquist

• Nova Appointment

Nova Chemical Corporation, New York City, announces the appointment of William R. Tornquist to its sales organization effective January 1, 1950. Mr. Tornquist comes to Nova with a background of many years experience in the textile printing, dyeing and finishing field. He was formerly plant manager of the Clearwater Manufacturing Co., Clearwater, S. C., and most recently administrative assistant to W. H. Grier, Vice President and General Manager of Rock Hill Printing and Finishing Co., Rock Hill, S. C. In addition to sales work Mr. Tornquist will render technical service, calling principally on the printers and dyers in the New Jersey and Pennsylvania areas.

• Historical Textile Documents

A series of prints of textile machines and workshops, dating from the 18th Century (1760) have been reproduced from very detailed steel engravings by J. H. Villard, Inc., 175 Fifth Avenue, New York 10. The antique character which, is said to have been retained reportedly conveys all the charm attached to the old crafts and makes them valuable witnesses of basic ideas from which later developments have emerged. The series consists of: preparatory machines (throwing, warping, beaming, slashing machines), weaving (plain loom, brocade on the pre-Jacquard loom, figured velvet, ribbon loom), hosiery (pedal-sinker loom) and finishing (stone mangle workshop). The pictures come framed and unframed. Illustrated pamphlets are sent free on request to the publishers: J. H. Villard, Inc., 175 Fifth Avenue, New York 10.

• Streaker Joins Atlas

George L. Wirtz, President of The Atlas Mineral Products Company has announced that William A. Streaker, a recent graduate of the University of Illinois has joined The Atlas Mineral Products Company as a Chemical Engineer.

• CLASSIFIED ADVERTISEMENTS •

CONFIDENTIAL EMPLOYMENT SERVICE: For Dyers, Chemists, Colorists, Managers, Superintendents and others seeking positions and for employers seeking men. Attractive positions paying splendid salaries open for capable men. Charles P. Raymond Service, Inc., 294 Washington St., Boston, Mass. Over 50 years in business.

POSITION WANTED: Dyestuff laboratory technician and color matcher. Thoroughly experienced testing and demonstrating dyestuffs on all fibers. Print shop and laboratory background. Top references. Write Box No. 735.

POSITION WANTED — Colorist, textile printing. Thoroughly experienced roller and screen printing on all fabrics. Supervise production. Complete technical knowledge. Highest references. Write Box No. 736.

POSITION WANTED: Experienced dyer, graduate Philadelphia Tech., 1933. 10 years at Klugers New Process Dyeing & Finishing Co. Capable dyeing all mixed fabrics, Jigs, Boxes, Pad work, Multi-Filament Crepes, Satins, Taffetas, Plied Yarns, Tissue Failles, Romaines, Alpacas, Luanas, Gabardines, Pigment Crepes, all Acetate Crepes, Gross dyeing of all mixed fabrics. A great amount of discharge dyeing experience. Saponification work. Write Box No. 757.

POSITION WANTED—Foreman Dyer—25 years experience dyeing nylon, cotton, wool, rayon, silk, acetate and their mixtures. Excellent color matcher. References. Married. Permanent position with advancement. Write Box No. 743.

RESPONSIBLE VETERAN, (25), married, three years college, with four years experience in dyestuff and dyestuff chemical application desires permanent position in production or sales department. Write Box No. 761.

FOREIGN SALES REPRESENTATIVE AVAILABLE—Formerly with leading European dyestuff manufacturer over 20 years' experience would consider executive position with progressive concern or partnership in established business. Write Box No. 760.

WANTED—Salesman to sell textile specialties in Middle West for old established manufacturer. Prefer one with following and some practical knowledge of dyeing and finishing. State age, experience and compensation expected. Write Box No. 762.

ASSISTANT DYER WANTED—Capable of dyeing knitted wool and synthetic fabrics. Write full details as to background and work experience to Box No. 763.

WANTED—HOSIERY DYER—Well-established New England manufacturer of F.F. nylon hosiery desires an experienced dyer. Must have enough chemical and operating experience to take charge of dyehouse. Preference given to graduate of textile school. Apply for interview to J. S. Kornreich, 1569 Beacon St., Brookline, Mass. State qualifications, describe education and work experience.

POSITION WANTED—Textile Chemist, dyer, B.S. Degree Chemistry January '49, plus degree from Textile College January '50. Some experience skein dye house and piece goods mill. Age 25, married. Seeks responsible position. Write Box No. 764.

POSITION WANTED: Young man, university graduate in chemistry, fine technical and theoretical background in chemistry and textile fibers. One year experience—as assistant to dyer—in synthetics and cotton piece goods also wool and nylon yarn. Position with a progressive dyeing and finishing firm desired. Write Box No. 766.

WANTED—Immediate position open for top Textile Colorist in large, most modern screen print plant in Metropolitan area specializing in tie fabrics. Excellent opportunity for man of experience and proven ability. State full qualifications in first letter. All replies strictly confidential. Write Box No. 765.

TRY

A

CLASSIFIED!

NOTICE

CLASSIFIED ADVERTISEMENTS

ARE RESTRICTED TO

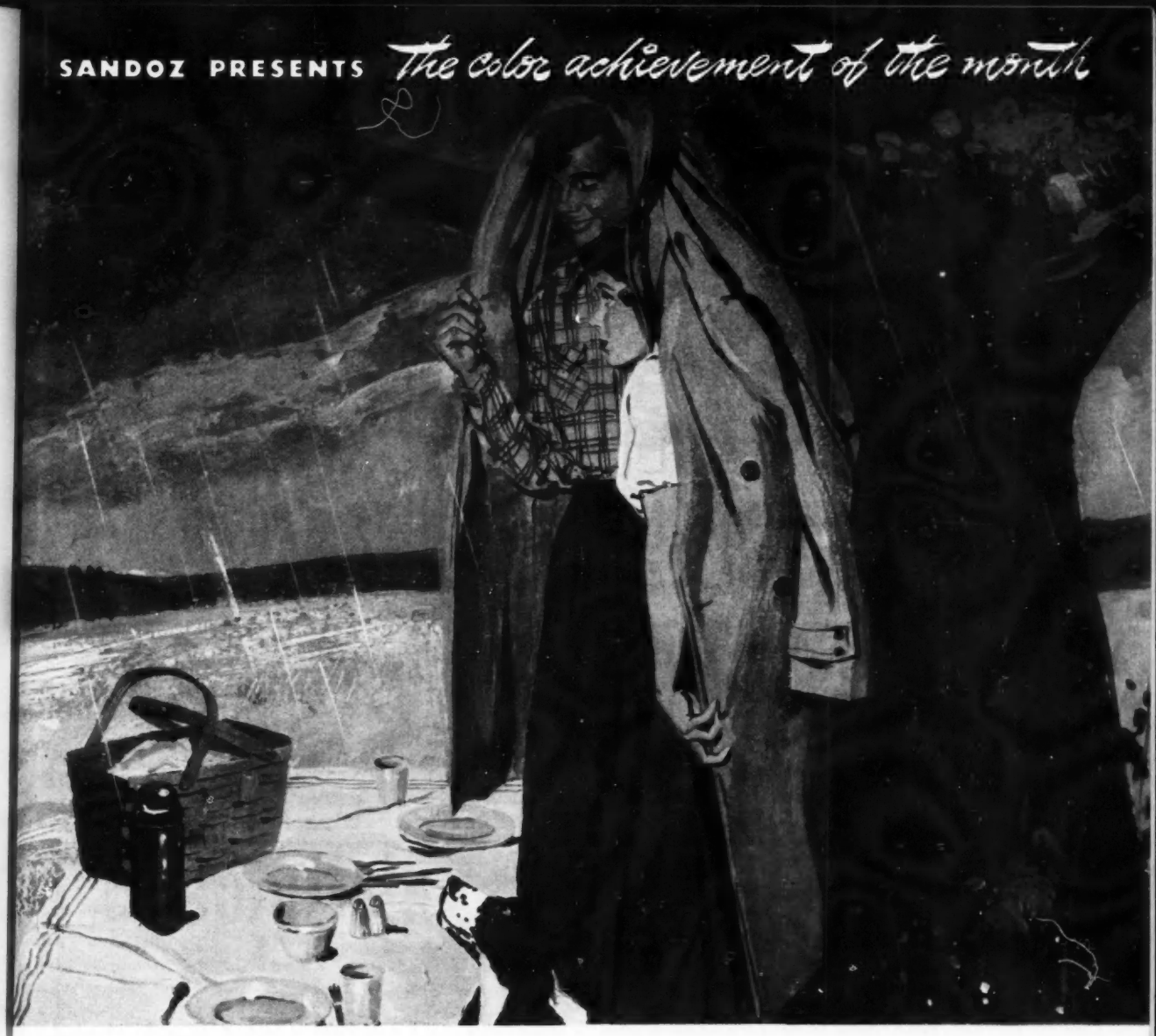
HELP WANTED — POSTIONS WANTED

MACHINERY (Wanted or For Sale)

OTHER TYPE COPY WILL NOT BE ACCEPTED

American Dyestuff Reporter

SANDOZ PRESENTS *The color achievement of the month*



Water Colors ...BY RIEGEL

You won't find Riegel fabrics running from the rain . . . and you won't find CUPROFIXED colors running from *any* kind of moisture.

CUPROFIX is an after-treatment for certain direct colors that helps producers of cotton and rayon fabrics to meet customer requirements at a cost, for dyestuffs, much less than vat dyes.

Used with wrinkle-resistant treatments, CUPROFIX greatly improves wet fastness — both in the resin bath and in the washing machine.

CUPROFIX also improves fastness to light, perspiration, dry cleaning and hot wet pressing. Its use does not affect fibre strength.

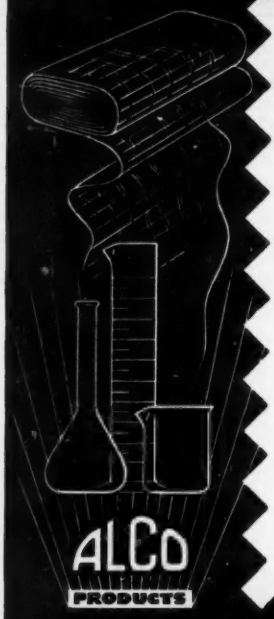
Many mills, like Riegel, are already CUPROFIX users. Get full details about CUPROFIX from your Sandoz representative or write for your free copy of the new CUPROFIX booklet.

And for any chrome, acid or direct dyes . . . or auxiliary chemicals . . . for both natural and synthetic fibres . . . be guided by the "color achievements" you see in Sandoz advertisements.

SANDOZ CHEMICAL WORKS, INC., 61 VAN DAM STREET, NEW YORK 13, N. Y.

Application laboratories and stocks at Boston, Philadelphia, Charlotte, Chicago, Los Angeles, Toronto • Other branches at Providence, Paterson and Montreal

SANDOZ *thinks ahead with textiles*



VULCANOLS

provide
DURABLE,
SLIP-RESISTANT
FINISHES

Samples and technical information mailed promptly on request.

ALCO OIL & CHEMICAL CORPORATION
TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

SOUTHERN DISTRIBUTORS
WICA COMPANY INC.
CHARLOTTE, N.C.

DYESTUFFS
BICK & CO., INC.
READING, PA.
CHEMICALS

HERE'S YOUR HEADQUARTERS FOR

Acetate Dyes Intermediates

Let Turner be your headquarters for this complete quality line of acetate dyes and intermediates. The Para Amino Acetanilide, Quinizarine and PNOT are excellent intermediates for many dyestuff processes.

Investigate these Quality Products

ACETATE DYES • QUINIZARINE
PARA AMINO ACETANILIDE
PARA NITRO ORTHO TOLOUIDINE
(Fast Scarlet G Base)

Selling Agents for CROWN CHEMICAL COMPANY

JOSEPH TURNER & CO
RIDGEFIELD, NEW JERSEY
83 EXCHANGE PLACE, PROVIDENCE, R. I.
435 N. MICHIGAN AVE., CHICAGO 11, ILL.
Direct New York Telephone: CHickering 4-7531

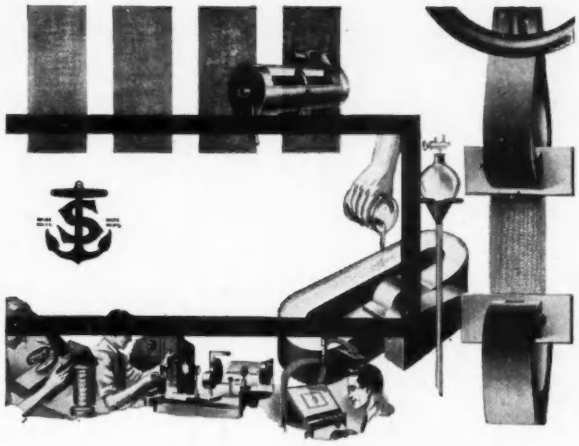
Decolorizing

Two textile decolorizing and reducing agents stand out —"Virginia" liquid Sulfur Dioxide (SO_2) and "Virginia" Sodium Hydrosulphite ($Na_2S_2O_4$). Use them for convenience and economy.

"Virginia" liquid SO_2 does a fine antichlor job in finishing cottons. 99.98+ percent pure—easy to store, handle, use. Shipped in cylinders, drums, tank cars. Our $Na_2S_2O_4$ is *concentrated.* A uniformly crystalline white powder—stable, free-flowing, quickly soluble in water. 250-pound single-trip steel drums. Use it freely as a reducing agent in your cotton vat-dyeing, stripping, decolorizing.

Get full details about both these "Virginia" time- and money-savers. Descriptive folders on request. Write VIRGINIA SMELTING COMPANY, West Norfolk, Virginia.

VIRGINIA Chemicals
ESTABLISHED 1898
WEST NORFOLK • NEW YORK • BOSTON • DETROIT



HOW SOLVAY'S LABORATORY FACILITIES CAN HELP YOU

Manufacturer . . . processor . . . convertor—*everyone* needs help sometimes in overcoming a production problem involving alkalies and associated chemicals. And at such times, SOLVAY Laboratory Facilities may be able to help you find the solution.

SOLVAY Laboratory Facilities include special equipment for serving industries that consume SOLVAY products. This equipment is in almost constant use in connection with our studies of problems from industries such as glass, paper, textile, bottling, sanitation, cleaning and laundry. SOLVAY Laboratory Facilities are intended to supplement the work of your own laboratory . . . and to offer you additional facilities which your technical department may not have.

Should you run into some difficulty in the utilization of our products—don't hesitate to ask SOLVAY TECHNICAL SERVICE for help. If it involves alkalies or associated products, we are ready to serve you! Write us about your problems in strict confidence—there's no cost or obligation.

Industry-Wise
SOLVAY Technical Service
Specialists in Specific Industries

SOLVAY SALES DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

BRANCH SALES OFFICES:
Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit
Houston • New Orleans • New York • Philadelphia • Pittsburgh
St. Louis • Syracuse

COMMONWEALTH
COLOR & CHEMICAL CO.

More than forty years' experience in the manufacture of Chemical Specialties, Dyestuffs and Dyewoods for the Textile and Allied Trades . . .

Main Office and Works:
3240 GRACE AVENUE • NEW YORK 67, N.Y.
Branches: PHILADELPHIA • CHICAGO • GLOVERSVILLE • MONTREAL

Best by every Test-

assures a better hand for your yarns and fabrics—

AQUAKAL 74

Aquakal 74 is the rapid penetrant and leveling agent that tops the list — by Draves Test and on your machines. Use it wherever fast, even wetting and penetration are necessary.

•

HYDROXY HAND CREAM — FOR THE OPERATORS HANDLING NYLON, TO KEEP THEIR HANDS SMOOTH.

•

KALI MANUFACTURING CO.

Manufacturing Chemists

427 Moyer Street • Philadelphia 25, Pa.

LeaTex

The name that means leadership in

CHEMICAL SPECIALTIES

for the TEXTILE INDUSTRY

"Always Reliable"

LEATEX CHEMICAL COMPANY
2722 N. HANCOCK ST., PHILADELPHIA, PA.

VANCIDES

The Fungicides and Bactericides that are SAFE to use

they're . . .

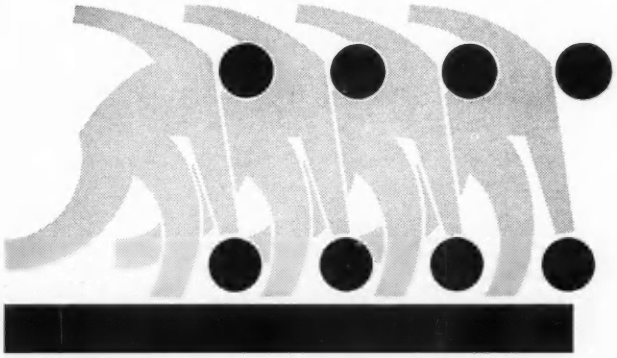
NON-TOXIC

NON-IRRITATING

STABLE • NON-VOLATILE

SEND FOR DESCRIPTIVE LITERATURE

R. T. VANDERBILT CO., INC. 230 Park Ave. New York 17, New York



BLACKS

OF STRIKING

UNIFORMITY

ACID • DIRECT • ACETATE • FORMALDEHYDE

Consult your local dyestuff distributors for information and samples. Shipments can be made from their convenient stocks or from our Baltimore and Paterson warehouses.

YOUNG ANILINE WORKS, INC.

Office and Factory
2731 Boston Street
Baltimore 24, Md.

Paterson Office
50 East 13th Street
Paterson, N. J.

AYW

10 PRODUCTS of PROVEN DEPENDABILITY

WHICH SHOULD WARRANT YOUR ATTENTION

*AQUAROL: A water repellent for processing woolen, cotton and rayon fabrics, also produces excellent results in splashproofing or finishing all types of hosiery.

*PARAMINE T A: A cation active softener for processing cotton and rayon cloth to obtain a soft, smooth, pleasing finish.

ANTHOMINE: Auxiliary used in all wool dyeing processes to produce a uniform shade and impart a soft pleasing hand to stock, yarn and cloth. Improves exhaustion of dye bath and increases color yield. Very effective for levelling shade of tippy and mixed wools.

*PARAPON S A: A highly efficient leveler and softener for dyeing and finishing all types of yarn, cloth and hosiery to produce a uniform dyeing and a soft full hand.

*ARIPEL F S: Finish and gas inhibitor for processing dyed acetate rayon—produces a soft, full feeling finish and prevents gas fading of the color.

*LANITOL F: A synthetic detergent possessing exceptional scouring and washing properties for processing wool, cotton, rayon or nylon.

*ALGEPON V A: Auxiliary used in dyeing vat colors to retard reoxidation of the reduced bath and produce a solid and uniform shade—also effective in stripping vat dyeings.

*CULOFIX: Used as an after treatment in last rinse to prevent bleeding of direct dyed cotton or rayon in water.

*DIAZONOL A C: For boiling out cotton cloth in pressure or open kiers to produce greater absorbency and cleaner material. Excellent for pre-boiling knitted cloth in preparation for chlorine bleach. Also used with good results for boiling out cotton or rayon cloth on the jig.

*TETRANOL: A rapid wetting and penetrating agent. Active in acid, alkaline and salt solutions and not affected by hard water, may be used in all types of dyeing operations to insure positive penetration of color and a uniform and solid shade.

And a complete line of Oils, Chemicals, Softeners and Finishes for Wet Processing All Textile Fibres

®REG. U. S. PAT. OFF.

ARKANSAS CO., INC.
Newark, New Jersey
Manufacturers of Industrial Chemicals for Over 40 Years

INDEX TO ADVERTISERS

Aktivin Div., The (Heyden Chemical Corp.)
Alco Oil & Chemical Corp. XXVI
Althouse Chemical Co., Inc.
Amalgamated Chemical Corp.
American Aniline Products, Inc.
American Cyanamid Co. (Ind. Chem. Div.)
American Polymer Corporation
Arkansas Company, Inc. XXX
Armour & Co. ..... Second Cover
Arnold, Hoffman & Co., Inc. XV
Atlantic Chemical Co., Inc.
Atlantic Refining Co.
Atlas Electric Devices Co.

Barium Reduction Corp. XXXI
Barry Chemical Co.
Bick & Co., Inc. XXVI
Blickman, Inc., S.
Burkart-Schier Chemical Co. XXXII
Butterworth & Sons Co., H. W.

Calco Chemical Division, American Cyanamid Co.
Calgon, Inc.
Campbell & Co., Inc., John IV
Carbic Color & Chemical Co., Inc. XXII
Ciba Company, Inc. III
Colgate-Palmolive-Peet Company
Commonwealth Color & Chemical Co. XXVIII
Crucible Steel Co. of America ..... Third Cover

Drew & Co., Inc., E. F.
Du Pont de Nemours & Co., E. I.
Dyestuffs Division
Electrochemicals Dept.
Fine Chemicals Division

Fancourt & Co., W. F. VI

Geigy Company, Inc. ..... Front Cover
General Dyestuff Corp. XIII
Girdler Corp., The
Glycerine Producers Association
Gross & Co. VIII
Gurley, W. & L. E.

Hart Products Corp.
Hercules Powder Co.
Heyden Chemical Corp.
Hinnekens Machine Company, Inc.
Hooker Electrochemical Co.

International Nickel Co., Inc.
International Salt Co., Inc.

Typical Analysis of BARIUM'S

SODIUM SULPHIDE FLAKES

Fe	0.0005%
Other Heavy Metals	Nil
NaCl	0.40
Other Na_2O (not oxidizable)	1.35
Na_2S	61.00

Manufactured in Large Tonnage by . . .

BARIUM REDUCTION CORPORATION

SOUTH CHARLESTON 3, WEST VIRGINIA

products for...

KIER BOILING
BOILING OFF
SCOURING
SIZING
DESIZING
BLEACHING
DYEING
SOFTENING
FINISHING

Inquiries Solicited

UNITED CHEMICAL PRODUCTS CORP.

Main Office and Plant:
YORK AND GOLGATE STREETS • JERSEY CITY 2, N. J.
Branches:
Southern Division P. O. Box 1237 New Orleans 10, Louisiana
Western Agents: CHEMICAL PRODUCTS CORP., AURORA, ILL.

IT'S WHAT IS IN THE DRUM THAT MAKES THE DIFFERENCE

SAVE, SAVE, SAVE!

with

NYLTEX-G

When running
Monofilament Yarn

ONLY THE TROUGH IS NEEDED
Eliminates oil jars too!

SEND FOR SAMPLES • INFORMATION •
So. Office 617 Johnston Bldg. Charlotte, N. C.

RICHMOND OIL, SOAP AND CHEMICAL COMPANY INC.

1041-43 FRANKFORD AVE. PHILADELPHIA 25, PA.

Export Agents
HOWARD G. GODFREY AND CO., INC.
456 Fourth Ave.
N. Y. 16, N. Y.
•
Cable Address
Godfreyarn

By Ceil Chapman

To the textile chemist Milady owes much of her pleasure in the marvelously dyed and finished fabrics of today. At Burkart-Schier our laboratory and staff is ever ready to give its capable aid in solving the many problems posed by the modern wet-processing of textiles.

BURKART-SCHIER CHEMICAL CO.

BURK-SCHIER CHATTANOOGA, TENNESSEE BURK-SCHIER

PENETRANTS • SOFTENERS • SOLUBLE OILS • FINISHES

INDEX TO ADVERTISERS

Kali Mfg. Co.	XXVIII
Kearny Manufacturing Company, Inc.	
Kelco Co.	IX
Laurel Soap Mfg. Co., Inc.	
Leatex Chemical Co.	XXVIII
Manhattan Storage & Warehouse Co.	
Mathieson Chemical Corp.	
May, Inc., Otto B.	
Maywood Chemical Works	XIV
Metalsmiths Div., Orange Roller Bearing Co., Inc.	XXXIII
Monsanto Chemical Co.	VII
National Aniline Division, Allied Chemical & Dye Corp.	XXIV
National Starch Products	
Nopco Chemical Co.	
Nova Chemical Corp.	
Nyanza Color & Chemical Co., Inc.	X
Onyx Oil & Chemical Co.	XVIII
Perkins & Sons, Inc., B. F.	
Procter & Gamble	XVI
Prufcoat Laboratories, Inc.	XXXIV
Reading Scientific Company	XXXIII
Refined Products Corp.	V
Richmond Oil Soap & Chemical Co., Inc.	XXXI
Rohm & Haas Company	
Royce Chemical Co.	Back Cover
Sandoz Chemical Works, Inc.	XXV
Scholler Bros, Inc.	XI
Sharples Chemicals Inc.	XII
Socony-Vacuum Oil Co., Inc.	
Solvay Sales Div., Allied Chemical & Dye Corp.	XXVII
Standard Brands, Inc.	XIX
Standard Chemical Products, Inc.	
Standard Corrugated Case Corp.	XXXIII
Synthron, Inc.	
Tennessee Eastman Corp.	
Turner & Co., Joseph	XXVII
United Chemical Products Corp.	XXXI
U. S. Vanadium Corp. (Niacet Chemicals Div.)	XXXIV
Vanderbilt Co., Inc., R. T.	XXIX
Van Vlaanderen Machine Co.	XVII
Virginia Smelting Co.	XXVII
Wallerstein Co., Inc.	XX
Wolf & Co., Jacques	XXI
Wyandotte Chemicals Corp.	
Young Co., J. S.	
Young Aniline Works, Inc.	XXIX
Zinser & Co., Inc.	

FOR THE TEXTILE INDUSTRY
SPECIALIZED IN THE MANUFACTURE OF HI-TEST CORRUGATED SHIPPING BOXES
STANDARD
CORRUGATED CASE CORP.
Manufacturers of Corrugated Shipping Boxes
RIDGEFIELD · NEW JERSEY
TELEPHONES: NEW YORK • PEnnsylvania 6-8583 • NEW JERSEY • MOrsemere 6-5200
STANDARD CORRUGATED CASE CORP.
STANDARD
STANDARD CONTAINERS ARE
"Standard of Shippers"

Try them once — you'll buy them always!

STAINLESS STEEL and MONEL UTENSILS by METALSMITHS

- Designed right
- Made right
- Priced right

You'll find METALSMITHS a reliable, economical source of high quality, corrosion-resistant utensils. Each item is expertly and durably fabricated. Full range of sizes on all items in stock for prompt shipment.

Send for NEW Catalog—Price List showing complete line and latest prices.

METALSMITHS

Division of Orange Roller Bearing Co., Inc.
562 White Street Orange, N. J.

Specialists in Corrosion-Resistant Equipment for Over 25 Years

PERMANENT AGELESS DURABLE

Stainless Batch Cans

Cap. Gal.	Dia. In.	Height In.	Lockseamed	All-Welded
10	13¼	18	$22.50	$27.00
15	15¾	18	27.00	33.00
20	16	24	30.00	39.00
25	18	24	37.50	45.00
30	20	24	45.00	51.00
40	22¾	24	57.00	57.00
50	22¾	30	63.00	63.00
75	28	30	75.00	75.00

SPECIFICATIONS: Type 304 Stainless Steel, heavy gauge and polished, double lockseamed and soldered or all-welded and blended on the inside with inside bottom corner rounded. Aluminized handles and steel rings around top edge and bottom edge. Top edge curled and wired. Bottom ring softbrazed or tackwelded to can. Covers and special equipment built to order.

Seamless Stainless Steel Dyehouse Ware. Ask for Price List.

READING SCIENTIFIC COMPANY

13th & Pike Streets Reading, Penna.

Cut painting maintenance costs

. . . in the bleachery

. . . in the dye house

with PRUFCOAT

Yes, this modern synthetic resin protective coating has a ten year record now of standing up where ordinary paints fail. On walls, ceilings, floors, pipes, vats, ducts and machinery — in the presence of strong corrosives like caustic soda, sulphuric, nitric and phosphoric acids — *Prufcoat saves you money because it lasts longer, gives better protection.*

But don't take our word for it. Read what a leading textile user reports after many years of painting experience: "Prufcoat on box machine, continuous dye machine, bleach machine, mercerizers, cloth bins and other areas in our bleachery and dye house . . . *time between repaint jobs more than doubled.*"

GET *Proof* BEFORE YOU BUY

Write for the new *Prufcoat Proof Packet.* Contains in one easy-to-file folder reports from outside testing laboratories, actual case histories, and Prufcoat Protecto-graph Plan for analyzing your own painting maintenance costs. *Get your copy today.*

Prufcoat Laboratories, Inc.
63 Main St., Cambridge, Mass.

SAVES More because it PROTECTS More

8 Attractive Colors
Proof against Acids, Alkalies, Oil, Water

NIAPROOF

TRADE-MARK

WATER-SOLUBLE ALUMINUM ACETATE POWDER

for water-repellent preparations

35.5-37.0% Al_2O_3 content

"Niaproof" Aluminum Acetate is readily soluble in water so that any strength of solution can be prepared as required.

ADVANTAGES OF "NIAPROOF" POWDER OVER SOLUTIONS:

STABILITY—No more losses due to precipitation of solutions.

PURITY—No injurious sulfates or chlorides to tender the fabric.

No contamination or discoloration from containers.

SAVINGS—Lower cost per pound of Al_2O_3 content.

Lower freight due to negligible water content.
Lower handling and storage costs.
Containers can be reused or resold.

ALUMINUM ACETATE
and
ALUMINUM FORMATE SOLUTIONS

also available

For further information write to:

Sales Offices: • *944 Niagara Bldg.* • *Niagara Falls, N. Y.*

Stainless steel works miracles only when the *right* type is matched to the right application. Crucible, a pioneer in the development of stainless steels, offers the services of our unsurpassed metallurgical staff to help you make the right choice.

And Crucible produces a complete range of sheet and strip in gauges, grades and finishes from ½" to 60" inclusive, as well as all other forms: plates, bars, tubing, forgings, wire and castings to meet your specific requirements. Data sheets are available on request. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, New York.

CRUCIBLE first name in special purpose steels

hot and cold rolled **STAINLESS SHEET AND STRIP**

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE • STEELS

DO NOT CIRCULATE
GREENVILLE PUBLIC LIBRARY
DO NOT CIRCULATE

Now! One hand for many tasks

Dispersall N, the new Royce dispersing agent, saves both space and costs for dyers of cellulosic materials. It reduces chemical stock inventories, and better serves every purpose for which it is recommended. It provides superior retarding action in vat dyeing, without loss of color. Inhibits crocking of naphtol-fast color salt dyed and printed materials. Better levels faultily dyed vat shades. And Dispersall N is highly efficient in stripping naphtol-fast color dyed goods to a clear ground. Sales technicians available for demonstration on request.

FOR CELLULOSIC MATERIALS

VAT AND NAPHTOL DYEING

VAT AND NAPHTOL PRINTING

VAT AND NAPHTOL STRIPPING

VAT AND NAPHTOL LEVELING

- ★ Permanently Uniform
- ★ Neutral
- ★ Stable and odorless
- ★ Water-Miscible
- ★ Excellent Wetting Efficiency
- ★ Hard-Water-Resistant

Dispersall -N

Dyeing Assistant
Stripping Auxiliary

ROYCE CHEMICAL CO.

CARLTON HILL, NEW JERSEY

MANUFACTURERS OF NEOZYME® • PAROLITE® • DISCOLITE® • DRYTEX® FABRITEX® • GUMOLITE® • CASTROLITE® • VELVORAY® • ZIPOLITE®

ROYCE CHEMICAL

®